OLYMPUS®

INSTRUCTIONS

ELECTROSURGICAL UNIT

PSD-30

CE 0197

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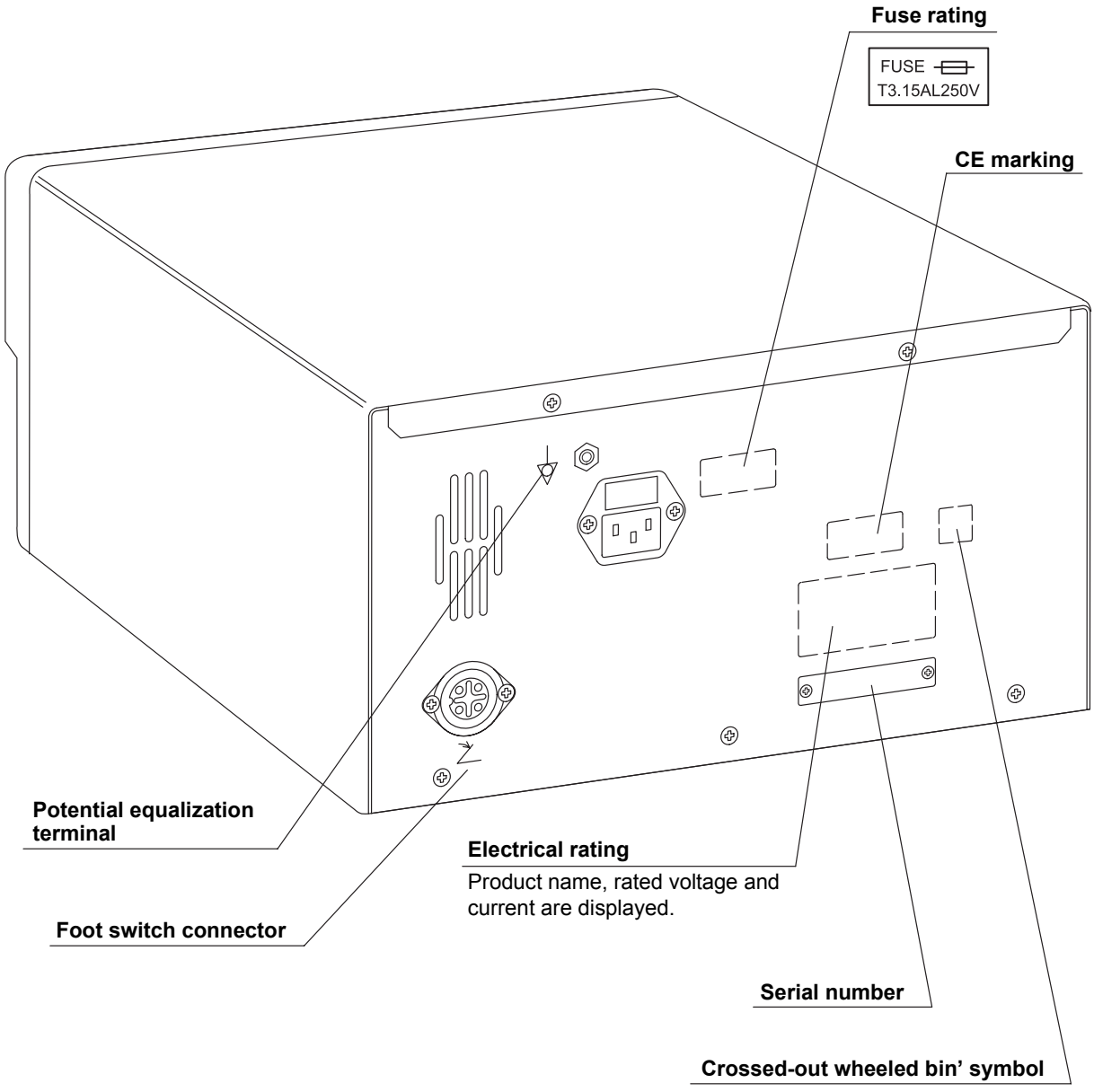
Labels and Symbols

Safety-related labels and symbols are attached to the instrument at the location shown below.

If labels or symbols are missing or illegible, contact Olympus.

❍ Rear side



Electrical rating

ELECTROSURGICAL UNIT

MODEL PSD-30
INPUT 220V – 240V ~
2A
50/60Hz

MONOPOLAR : 50W/300Ω
(SOFT/AUTO STOP 100Ω)
350kHz INT.10S/30S

❍ Back cover of this instruction manual

Manufacturer

Authorised representative in the European Community

Important Information — Please Read Before Use

- High frequency leakage current or spark discharge may cause patient, operator and assistant burns. Follow the dangers, warnings and cautions described in this instruction manual when using this electrosurgical unit.
- Always prepare for an emergency operation in case of unintentional patient burn, bleeding and perforation.

Intended use

This electrosurgical unit has been designed to be used with an Olympus endoscope (fiberscope or videoscope) compatible with electrosurgery, light source, electrosurgical accessories and other ancillary equipment for general and endoscopic electrosurgery (cutting and coagulation).
Do not use this electrosurgical unit for any purpose other than its intended use.

Applicability of endoscopic treatment

If there is an official standard on the applicability of endoscopic treatment as defined by a national or local medical administration, or other institution, such as an academic society, follow that standard when performing the procedure. Before performing endoscopic treatment, thoroughly study the properties, purposes, effects and possible risks (the nature, extent, probability and imminence) of the planned treatment and any alternative therapeutic method that can be performed. Carry out endoscopic treatment only when its benefits outweigh its risks. Fully explain to the patient the possible benefits and risks of endoscopic treatment as well as those of any therapeutic method(s) that can be performed instead of endoscopy, and perform endoscopic treatment only after patient consent is granted. During endoscopic treatment, continue to evaluate the potential benefits and risks, and stop the treatment if the risks become greater than the possible benefit to the patient.

Instruction manual

This instruction manual contains essential information on using this electrosurgical unit safely and effectively.
Before use, thoroughly review this manual and the manuals of all equipment which will be used during the procedure and use the equipment as instructed.
Keep this and all related instruction manuals in a safe, accessible location.
If you have any questions or comments about any information in this manual, please contact Olympus.

❍ Terms used in this manual

Wall mains outlet

An electrical outlet that has a terminal used exclusively for grounding.

User qualifications

If there is an official standard that outlines the qualifications required of medical personnel performing endoscopic treatments as defined by a national or local medical administration or other institution, such as an academic society, follow that standard. If there is no such standard, the operator of this instrument must be a physician who has been approved by the hospital's medical safety manager or surgical department manager.

Instrument compatibility

Refer to the "System chart" in the Appendix to confirm that this electrosurgical unit is compatible with the ancillary equipment being used.
Using incompatible equipment can result in patient injury and/or equipment damage.

Repair and modification

This electrosurgical unit does not contain any user-serviceable parts. Do not disassemble, modify or attempt to repair it; patient or user injury and/or equipment damage can result. This instrument is to be repaired by Olympus technicians only.
Some problems that appear to be malfunctions may be correctable by referring to Chapter 7, “Troubleshooting”.
If the problem cannot be resolved using the information in Chapter 7, contact Olympus.

Signal words

The following signal words are used throughout this manual:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices or potential equipment damage.

NOTE

Indicates additional helpful information.

Dangers, warnings and cautions

Follow the dangers, warnings and cautions described below when handling this electrosurgical unit. This information is to be supplemented by the dangers, warnings and cautions given in each chapter.

DANGER

- The HF equipment, when applied to a patient with a pacemaker implanted, may cause malfunctioning or failure of the pacemaker and may seriously affect the patient. Always confirm that it is safe to proceed with a cardiologist and the manufacturer of the pacemaker before proceeding.
- To prevent shock hazards, never apply the PSD-30 to the heart in combination with TYPE B or TYPE BF applied parts.
- When using the electrosurgical unit on or in the vicinity of the heart, be sure to use it with the minimum necessary output. Spark discharge during operation may affect the heart.
- Never install or operate the electrosurgical unit in locations where:
  - the concentration of oxygen is high.
  - oxidizing agents (such as nitrous oxide (N_2O)) are present in the atmosphere.
  - flammable anesthetics are present in the atmosphere.
  - flammable gases are present in the atmosphere.

  Otherwise, explosion or fire may result and cause damage to human body. Because this electrosurgical unit is not explosion-proof.
- The PSD-30 has been designed for flexible endoscopic applications. Therefore, do not use it for surgical operations.

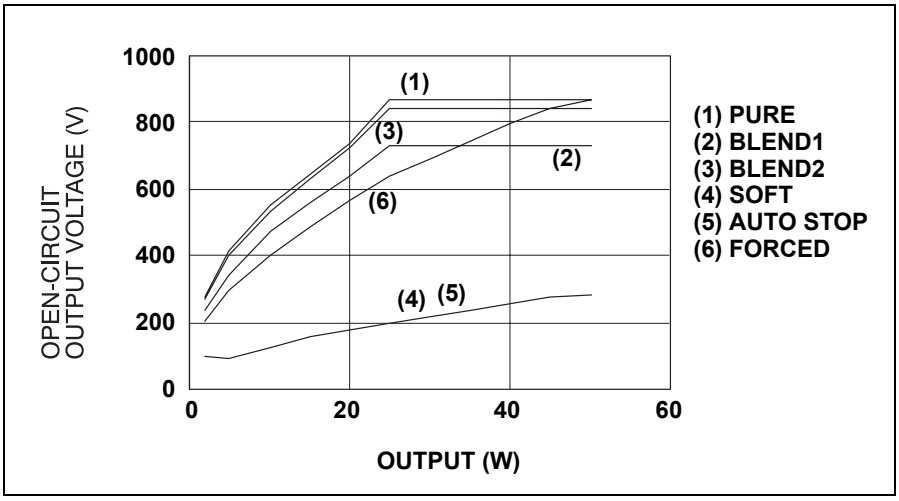
WARNING

- Always use the S-cord when endoscopic treatment is performed with an endoscope equipped with the S-cord connector mount. When using an endoscope without the S-cord connector mount, refer to the instruction manual and confirm that the electrosurgery is feasible with this endoscope. If the electrosurgical unit is used in conjunction with an endoscope that is not feasible with the electrosurgery, a burn to the patient, the operator or the assistant may occur.
- If the electrosurgical unit fails and the output is stopped during treatment, it may be impossible to continue treatment due to adhesion of the endo-therapy accessory to a mucous tissue or other accident. Prepare a spare electrosurgical unit as backup to ensure that the procedure can be completed without complication in case of a malfunction.

- Always have a defibrillator ready in case of a cardiac emergency. During operation of the defibrillator, remove the endoscope from the patient.
- To respond to possible patient bleeding, prepare at least the following three hemostatic procedures: coagulation, clipping and local injection.
- To prepare for possible accidents, emergency equipment for life-saving, intubation and appropriate pharmaceuticals should be located in or near the procedure room.
- Never attach the patient plate in the vicinity of a metal implant. The tissue in the vicinity of the metal implant may be burned.
- Keep the electrosurgical unit and ancillary cords (A-cord, P cord, S-cord) as far away as possible from other electromedical equipment and cords. If placed too close, high frequency signals or spark discharge noise from the electrosurgical unit may interfere with the operation of other equipment.
- To prevent patient burns, the electrosurgical unit and ancillary cords (A-cord, P cord, S-cord) should not come in contact with the patient or metal parts of the operating table. Furthermore, patients should also keep away from metallic parts of the operating table or other devices.
- Never loop the cords (A-cord, P cord, S-cord) or bundle cords together with cords belonging to other medical equipment. The high frequency signals or spark discharge noise generated by the electrosurgical unit may interfere with the operation of other medical equipment.
- The electrosurgical unit may interfere with electromedical equipment used in conjunction with it. Before use, thoroughly confirm the compatibility of all the equipment.
- Do not bring the tip of the electrosurgical accessory close to a metal clip or other accessories. The tissue around the metal clip or the accessory may be burned.
- To prevent electric shock, the electrosurgical unit is designed to function with insulated connectors that have Type CF electromedical equipment classifications (A-cord, P cord, P plate, S-cord). Therefore, to prevent shock caused by leakage current from other electrical equipment applied to the patient, the connectors from the other equipment should not be grounded.

- Should any abnormal output be suspected during operation, immediately terminate the use of the equipment and turn OFF the electrosurgical unit.
- To prevent operator shock, electrosurgical unit malfunction and electrosurgical unit damage, keep liquids away from all electrical equipment. If liquid gets on or into the electrosurgical unit, terminate operation immediately and contact Olympus.
- To prevent patient burns, the patient's skin surfaces should not touch each other (e.g. bare arm and side of chest) or any metal items in the procedure room. Remove any metallic items from the patient (wristwatches, jewelry, etc.) before starting the procedure.
- To prevent patient burns, the patient's clothes must be dry.
- To prevent operator and assistant burns, be sure to wear chemical-resistant gloves during operation.
- If the intestines contain a flammable gas, replace this gas with air or a non-flammable gas before performing the operation, to minimize the risk of fire or explosion.
- The endoscopic treatment performed should not include a therapy with which part of the treated tissue (poly head, etc.) or part of the endoscope distal end or endo-therapy accessory is in contact with or close to normal tissue. Otherwise, current flows to the normal tissue through the part of the treated tissue, the metallic parts at the endoscope's distal end or endo-therapy accessory and may cause burns.
- Be sure that the distal end of endoscope or accessory does not contact bridging fluids surrounding the target tissue. Electric current may flow to the surrounding normal tissue via the fluids and cause burns.
- Never grasp the target tissue with non-insulated grasping forceps. Non-insulated grasping forceps will disperse the electric current and normal operation may be impeded.
- To ensure electrical safety, the electrosurgical unit should not be used in conjunction with:
  - Electrical equipment whose safety against leakage current is not guaranteed.
  - Electrosurgical equipment whose safety in combined use is not guaranteed.

- If the electrosurgical unit is used in conjunction with a non-Olympus electrosurgical unit, keep the electrosurgical accessory away from the target area while the electrosurgical unit is in operation. Do not activate output of both units simultaneously. Patient or operator injury may occur due to the concentration of electric current.
- When using an electrocardiograph or other physiological monitoring equipment simultaneously with the electrosurgical unit on a patient, any monitoring electrodes should be placed as faraway as possible from the electrodes and patient plate used with the electrosurgical unit. If placed too close, high frequency signals or spark discharge noise from the electrosurgical unit may interfere with the operation of an electrocardiograph or other physiological monitoring equipment. Needle monitoring electrodes should not be used, as they may cause patient burns. Physiological monitoring equipment incorporating high frequency current limiting devices is recommended.
- Use physiological monitoring equipment throughout the entire procedure, for continuous observation of the patient's condition.
- The open-circuit voltage output characteristics of the electrosurgical unit are shown below. When setting the output level, first set it to a low output level and increase it gradually. If the output is initially set to an excessive level, the electrode's insulation could be damaged, which could cause operator and/or patient burns. Furthermore, it is recommended that you perform basic experiments before using the electrosurgical unit. If the instruction manual for the endoscopic accessory to be used stipulates a rated voltage, the output should be set so that it does not exceed that voltage.



- Flammable agents used for cleaning and disinfection must be allowed to evaporate before the electrosurgical unit is used. Also ensure that flammable solutions are neither on the patient's skin nor in the patient's body cavity when the electrosurgical unit is used.
- To prevent patient burns when the electrosurgical unit is used in conjunction with a non-Olympus electrosurgical unit, ensure that each unit is supplied with power from wall mains outlets. Also ensure that each unit is supplied with power from separate breakers.
- During operation, temporarily unused electrodes should be stored in an electrically insulated container. Unused electrodes should never be placed on the patient otherwise it may cause operator and/or patient burns.
- The electrosurgical unit should not be used for performing circumcisions.
- To prevent patient burns, never use cords with scratches or cracks.
- Studies have shown that smoke generated during electrosurgical procedures can be irritating and potentially harmful to surgical personnel. These studies recommend the use of surgical masks and adequate ventilation of smoke by the use of surgical smoke evacuators or other means.

– William S.Sawchuk, et al., “Infections Papilomavirus in the Vapor of Warts Treated With Laser or Electrocoagulation: Detection and Protection”, Journal of American Academy of Dermatology, Vol.21, No.1 (July, 1989): 41-49.
Yoshifumi Tomita, et al., “Mutagencity of Smoke Condensates Induced by CO_2-Laser Irradiation and Electrocauterization”, Mutation Research, Vol.89 (1989): 145-149.
Evaluation Report No.85-126. (National Technical Information Service, 1985): 1-28.

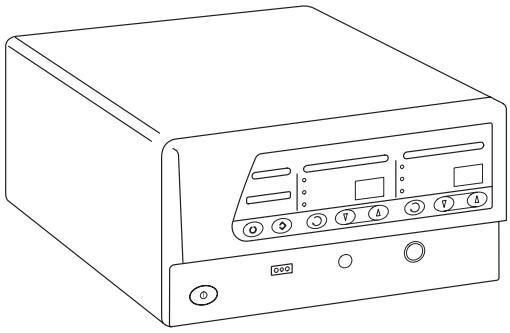
- When the patient is moved after the dispersive electrode has been attached, confirm that the dispersive electrode is still in proper contact with the patient otherwise it may cause operator and/or patient burns.
- Do not use the electrosurgical unit in a location exposed to strong electromagnetic radiation (microwave medical treatment equipment, short wave medical treatment equipment, MRI, radio or mobile phone). Electrosurgical unit malfunction can occur.

CAUTION

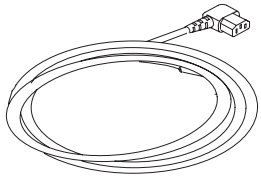
- To prevent electrosurgical unit damage, never short-circuit electrodes (accessories, patient plate).
- Repairs should be performed only by Olympus.
- The electrosurgical unit should only be used in accordance with the conditions described in “Operating environment” in the Appendix. The use under other conditions may impede normal performance, and/or result in equipment damage.
- During treatment, be sure that the distal (metallic) end of the endoscope, and metallic parts of accessory do not touch the normal tissue surrounding the target tissue. This action may cause severe burns.

Chapter 1 Checking the Package Contents

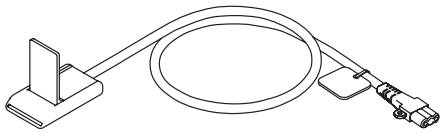
Match all items in the package with the components shown below. Inspect each item for damage. If the electrosurgical unit is damaged, a component is missing or you have any questions, do not use the electrosurgical unit; immediately contact Olympus.



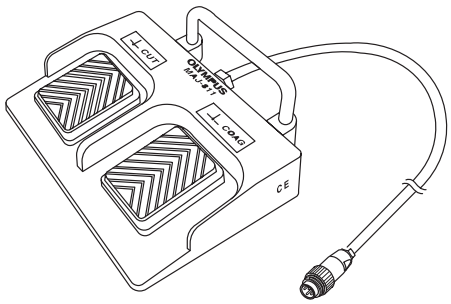
Electrosurgical unit (PSD-30)



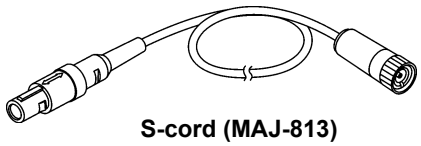
Power cord



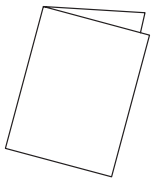
P cord (MAJ-814)



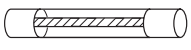
Foot switch (MAJ-811)



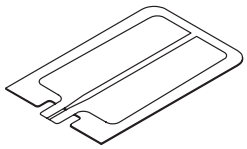
S-cord (MAJ-813)



Instruction manual



Spare fuse (MAJ-1052, 2 pcs)



P plate (MAJ-897, 10 pcs)

The following Olympus items are optional and may be purchased separately:

- A-cord (MA-255, MH-969)
- P plate (MB-574)
- P cord (MAJ-3)
- P adapter (MAJ-812)

For other combinations, refer to the “System chart” in the Appendix.

NOTE

- Place the instruction manual next to the electrosurgical unit or in another easily accessible place.
- Before using an optional item, thoroughly review and understand the instruction manual provided with that item.

Chapter 2 Nomenclature and Functions

2.1 Symbols and descriptions

Warning section

Refer to instructions

Patient plate

S-cord

High frequency output

Output timer

Coag. section

Soft

Auto stop

Forced

Cut section

Pure

Blend1

Blend2

Power switch

Power ON/OFF

Front panel

Type CF applied parts (defibrillation protected equipment)

STAND-BY

Program

Connector section

Active

S-cord

Patient plate

Refer to instructions

Connection for neutral electrode (isolated from earth at high frequency)

Rear panel

Potential equalization terminal

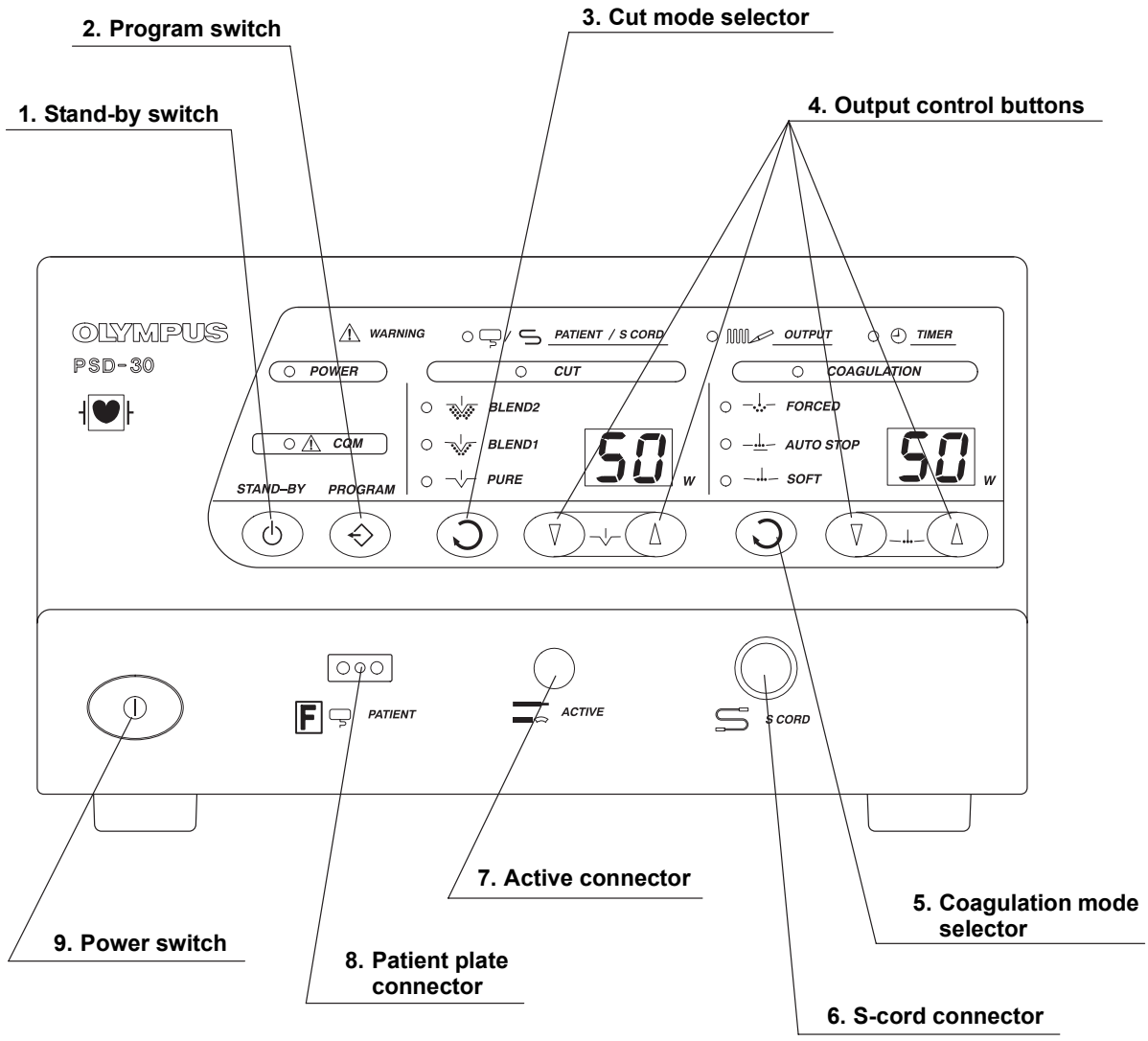
Foot switch

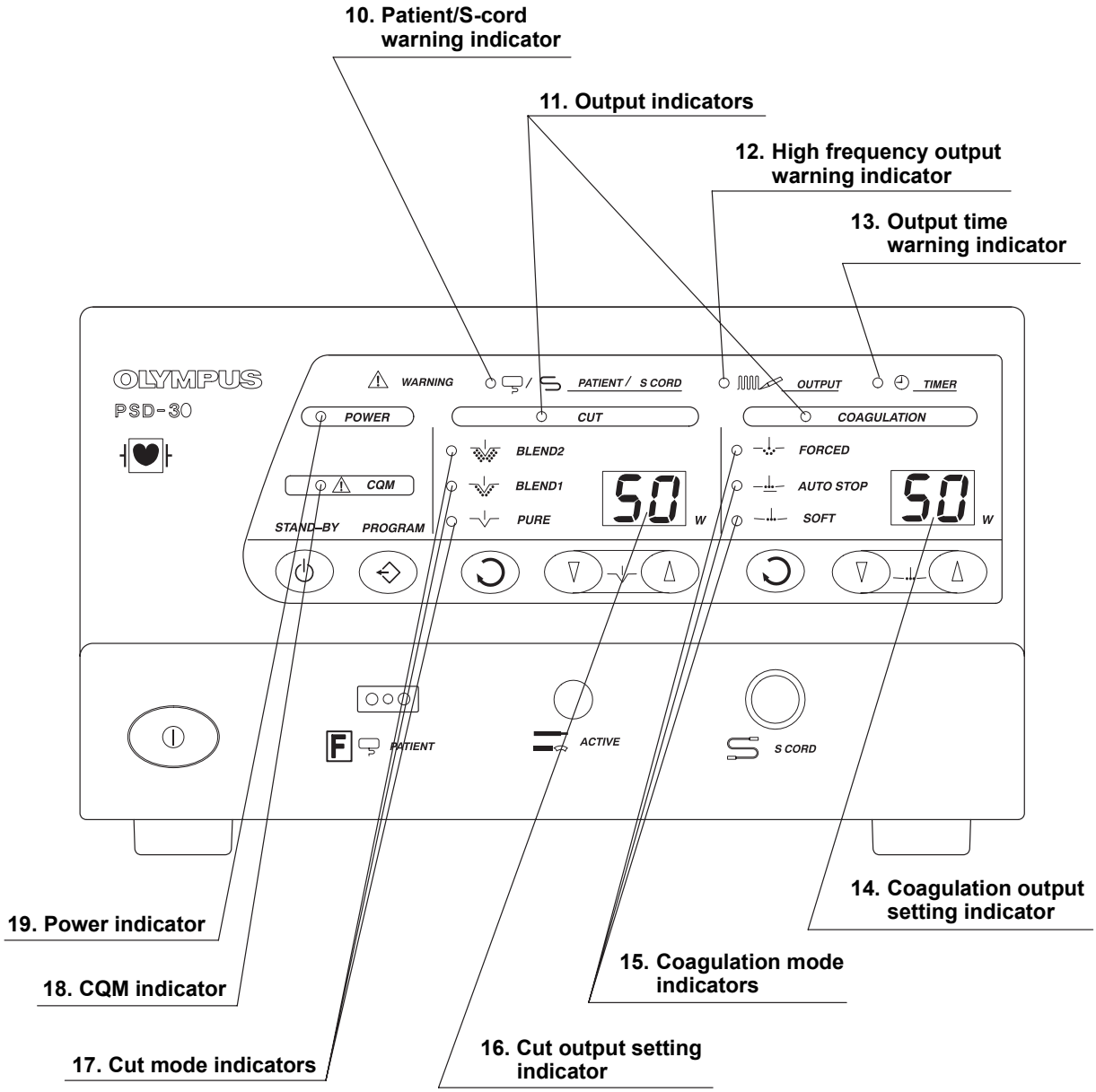
Fuse

Alternating current

SN Serial number

2.2 Front panel




10. Patient/S-cord warning indicator
11. Output indicators
12. High frequency output warning indicator
13. Output time warning indicator
OLYMPUS
PSD-30
WARNING
PATIENT / S CORD
OUTPUT
TIMER
POWER
CUT
COAGULATION
CQM
STAND–BY
PROGRAM
BLEND2
BLEND1
PURE
50
W
FORCED
AUTO STOP
SOFT
50
W
PATIENT
ACTIVE
S CORD
14. Coagulation output setting indicator
19. Power indicator
15. Coagulation mode indicators
18. CQM indicator
16. Cut output setting indicator
17. Cut mode indicators

1. **Stand-by switch**
   This switch disables high frequency output and change of setting. In the stand-by mode, the output tone volume can be adjusted.
2. **Program switch**
   This switch is pressed to store output setting and output mode and to recall stored output setting and output mode.
3. **Cut mode selector**
   This selector is pressed to select the cut mode.
4. **Output control buttons**
   When the "▲" button is pressed, the value of the output setting indicator increases. When the "▼" button is pressed, the value of the output setting indicator decreases.
5. **Coagulation mode selector**
   This selector is pressed to select the coagulation mode.
6. **S-cord connector**
   This connector connects the electrosurgical unit to the endoscope via the S-cord.
7. **Active connector**
   This connector connects the electrosurgical unit to the active electrode via the A-cord.
8. **Patient plate connector**
   This connector connects the electrosurgical unit to the patient plate via the P cord.
9. **Power switch**
   This switch is pressed to turn ON/OFF the electrosurgical unit.
10. **Patient/S-cord warning indicator**
    This indicator lights to indicate a defective connection of cords or broken wires in the P cord, patient plate or S-cord.
11. **Output indicators**
    During output, the indicator corresponding to the selected output (cut, coagulation) is lit.
12. **High frequency output warning indicator**
    This indicator lights to indicate that the output level is not in accordance with the set output level.
13. **Output time warning indicator**
    This indicator lights if output continues for longer than the specified time.
14. **Coagulation output setting indicator**
    This indicator displays the value set with the output control buttons.
15. **Coagulation mode indicators**
    These indicators light when the corresponding coagulation mode selector is pressed.

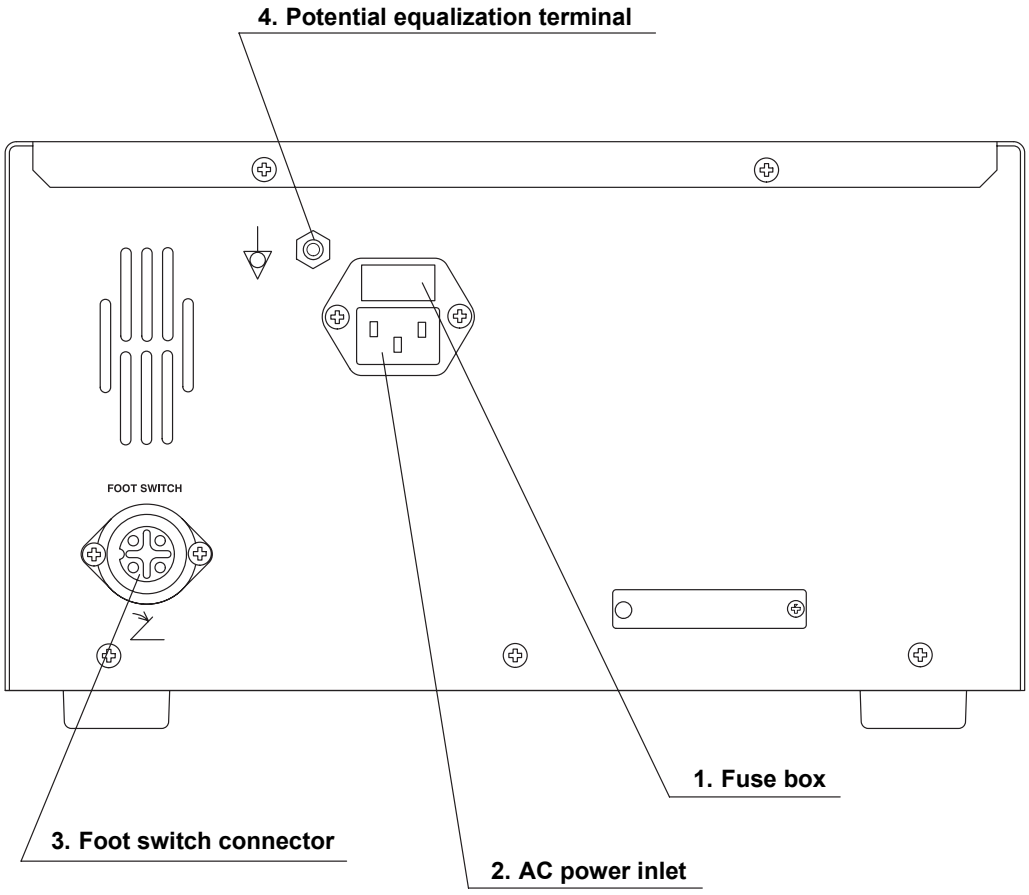
16. **Cut output setting indicator**
This indicator displays the value set with the output control buttons.

17. **Cut mode indicators**
These indicators light when the corresponding cut mode selector is pressed.

18. **CQM indicator**
When a split-type patient plate is connected, the CQM indicator lights to indicate that the connection between the patient and the patient plate is correct.

19. **Power indicator**
This indicator lights when the electrosurgical unit is turned ON.

2.3 Rear panel



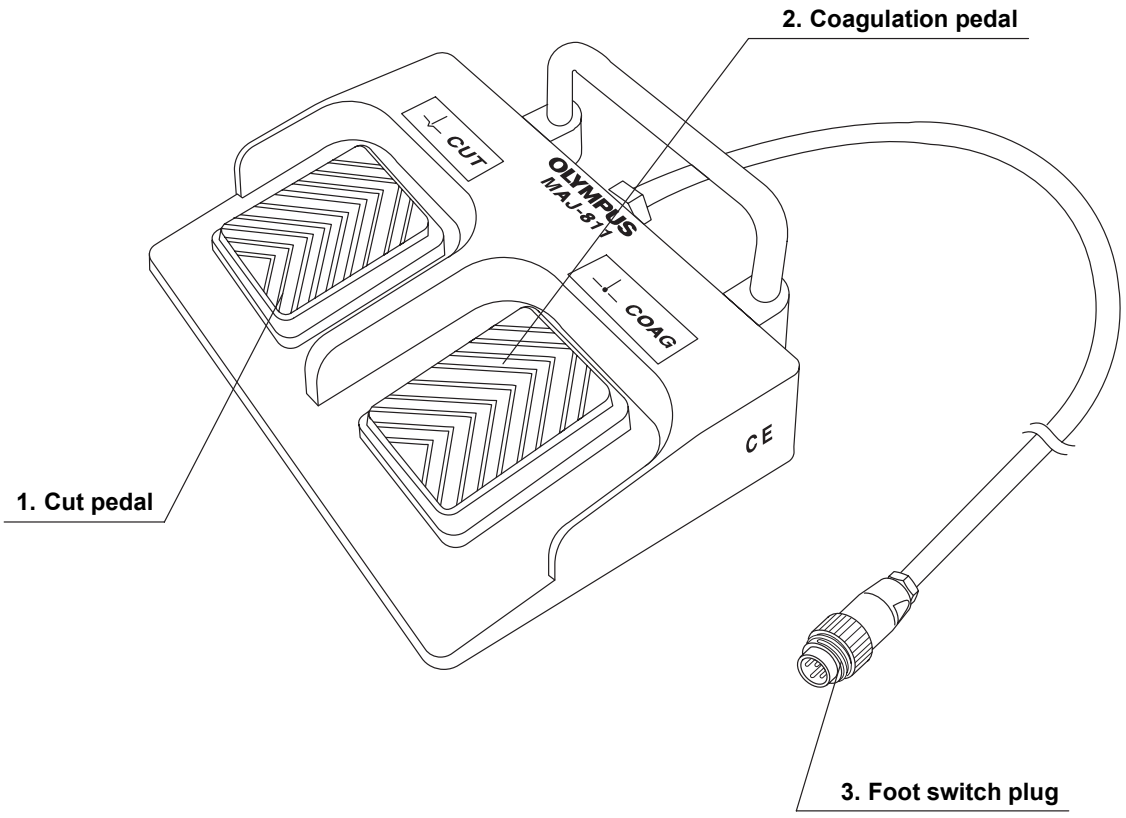
1. **Fuse box**
This box prevents short-circuits within the unit if equipment malfunctions.

2. **AC power inlet**
This inlet accepts the power cord.

3. **Foot switch connector**
This connector connects the foot switch (MAJ-811) to the electrosurgical unit.

4. **Potential equalization terminal**
To be equipotential, connect this terminal to a potential equalization busbar of the electrical installation.

2.4 Foot switch (MAJ-811)

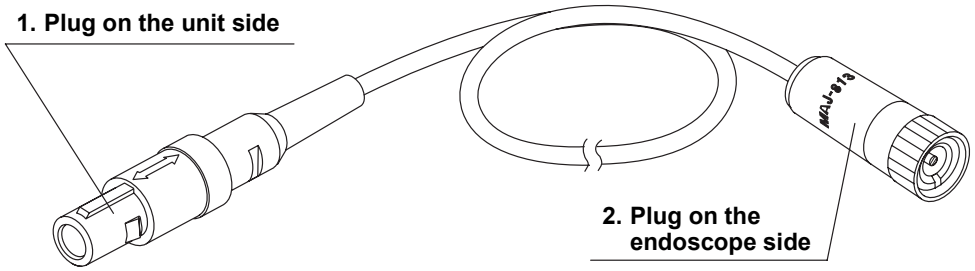


1. **Cut pedal**
This pedal starts and stops the cut output.

2. **Coagulation pedal**
This pedal starts and stops the coagulation output.

3. **Foot switch plug**
This plug connects the foot switch to the electrosurgical unit.

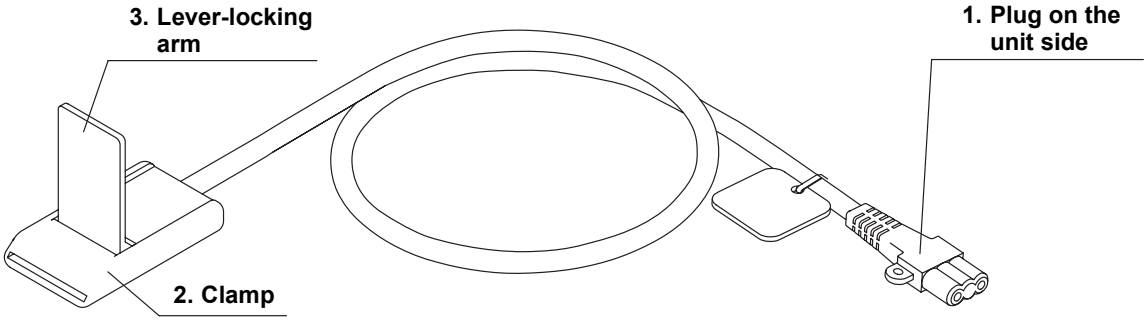
2.5 S-cord (MAJ-813)



1. **Plug on the unit side**
This plug connects to the electrosurgical unit to the endoscope via S-cord.

2. **Plug on the endoscope side**
This plug connects the endoscope to the electrosurgical unit via the S-cord.

2.6 P cord (MAJ-814)



1. **Plug on the unit side**
This plug connects the patient plate to the electrosurgical unit via the P cord.

2. **Clamp**
This clamp connects the patient plate to the electrosurgical unit via the P cord.

3. **Lever-locking arm**
This arm locks the clamp securely in the connector of the patient plate.

Chapter 3 Installation and Connection

Prepare the electrosurgical unit and compatible equipment (shown in the "System chart" in the Appendix) before each use, and refer to the instruction manuals of each system component. Install and connect the equipment as follows:

3.1 Installation of equipment

CAUTION

- Install the unit on a stable, level surface. Otherwise, the unit could fall, causing equipment damage and/or injury to the operator or patient.
- If the electrosurgical unit is placed on a cart, the cart must be of adequate strength and size to hold the unit securely.
- Never place the electrosurgical unit on its side or upside down. Otherwise, the electrosurgical unit does not work correctly.

NOTE

Place the instruction manual near the electrosurgical unit or in another easily accessible place.

1. Ensure that the operation of the electrosurgical unit is in accordance with the precautions described in "Dangers, warnings and cautions" on page 5.
2. Place the electrosurgical unit on a level, stable bench or cart.

3.2 Connection to an AC mains power supply

DANGER

Connect the power plug of the power cord directly to a grounded wall mains outlet. If the electrosurgical unit is not grounded properly, it can cause an electric shock and/or fire.

WARNING

- Do not bend, pull or twist the power cord. Electric shock, equipment damage and/or fire can result.
- To prevent the risk of electric shock, the housing of the electrosurgical unit must be grounded. Always connect the power cord plug to a properly grounded hospital grade AC receptacle (wall mains outlet).
- Always plug the power cord into a 3-pin outlet. Do not use a 3-pin/2-pin adapter, as it can impair the safe operation of the unit.
- Do not allow the power cord to become wet. Electric shock, equipment damage or fire can result.

CAUTION

- Always use the power cord provided with the electrosurgical unit. Never attempt to modify the power cord.
- If the same circuit breaker is used to supply power to other electrosurgical equipment, carefully consider the power requirements of the additional equipment and use circuit breakers that have ample capacity. Otherwise, the electrosurgical unit does not work correctly.

1. Confirm that the electrosurgical unit is turned OFF.
2. Connect the power cord to the AC power inlet of the electrosurgical unit and a wall mains outlet.

3.3 Connection of the foot switch

WARNING

- When the electrosurgical unit is turned ON and the foot switch is short-circuited, an alarm will sound and the output setting indicators will display “FL” and “FS” as shown in Figure 3.1. In this case, replace it with a new foot switch.

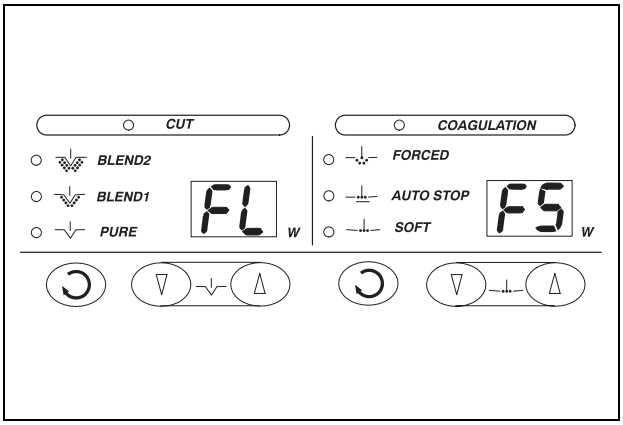


Figure 3.1

- Connect the foot switch plug securely to the PSD-30. Otherwise, high-frequency output may not activated. In this case, the electrosurgical accessory could cut the tissue mechanically, which could cause bleeding and/or perforation to the patient.

Before connecting, confirm that the foot switch plug is free of scratches and cracks and that the foot switch pedals are not damaged. With the arrow on the plug facing upward, insert the foot switch plug into the foot switch connector on the rear panel of the electrosurgical unit, and rotate the fastener ring fully clockwise to tighten it (see Figure 3.2).

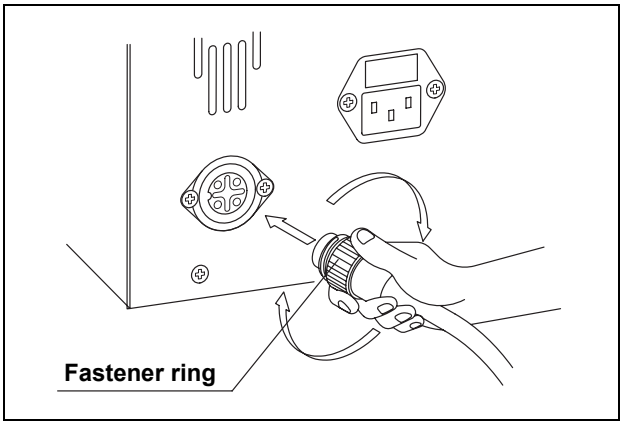


Figure 3.2

3.4 Connection of the patient plate

Improper connection between the patient plate and the patient's skin surface may cause burns. Always attach the patient plate as described below. For further details on patient plates, refer to the patient plate's instruction manual.

WARNING

- This electrosurgical unit should be used in combination with one of the patient plates shown in the following table. Using a patient plate other than those shown in the table may cause burns to the patient.

	split type	non split-type
disposable	OLYMPUS MAJ-897 3M 1180, 7180	3M 1149, 7149
reusable	–	OLYMPUS MB-574

- Do not use the patient plate if it has been damaged or modified. This may cause patient burns.
- If the connection of the patient plate is improper, an alarm will sound and the patient/S-cord warning indicator will light. Reconnect the patient plate.
- Do not attach the patient plate in the vicinity of a metal implant. The tissue in the vicinity of the metal implant may get burned.
- Body hair will impede proper contact with the patient plate. Improper contact between the patient plate and the patient's skin surface may cause patient burns. If necessary, shave all hair from the area to which the patient plate will be attached.
- Avoid placing the patient plate over bony prominences or scar tissue as proper contact will not be obtainable. This may cause patient burns.
- When using a reusable patient plate and its gauze pad for a prolonged period, make sure to keep the gauze pad moist with physiological saline solution or conductive paste.
- When using a disposable patient plate, ensure that the area of the patient's skin that will come in contact with the patient plate is completely dry. Otherwise, the patient plate may lose direct contact with the patient's skin and cause burns.

- To avoid air entrapment, do not fold or wrinkle the patient plate and make sure that its surface is smooth. The entire surface of the patient plate should be in direct contact with the patient's skin. Incomplete contact between the patient plate and patient's skin may result in patient burns.
- If the contact between the electrosurgical unit and P cord, P cord and the patient plate or the electrosurgical unit and P adapter is insufficient (when using MB-574), the patient/S-cord warning indicator will light and output will be prevented. Reconnect the cords.

CAUTION

According to patient's physical constitution, the CQM detects improper contact between the patient plate and the patient's skin and an alarm will sound, Patient/S-cord warning indicator will light and output will be prevented even if the contact is sufficient. In this case use the non-split type patient plate (MB-574, 3M 1149/7149). (P cord MAJ-3 and P adapter MAJ-812 are required when using MB-574).

❍ When using the patient plate (MAJ-897/3M 1149/1180/7149/7180)

WARNING

The patient plate (MAJ-897/3M 1149/1180/7149/7180) is a disposable product. Never reuse it after removing it from the patient. Attempting to reuse a disposable patient plate could cause patient burns.

1. After peeling off the protective film from the patient plate, attach the plate to the patient's thigh or place it under the patient's buttocks.

WARNING

Connect the patient plate and P cord securely. Otherwise, high-frequency output may not be activated. In this case, the electrosurgical accessory could cut the tissue mechanically, which could cause bleeding and/or perforation to the patient.

2. After confirming that the P cord (MAJ-814) is free of scratches and cracks, attach the P cord to the patient plate. Lift the lever-locking arm, then position the patient plate tab evenly between the clamp jaws. Lock the clamp by fully depressing the lever-locking arm (see Figure 3.3).

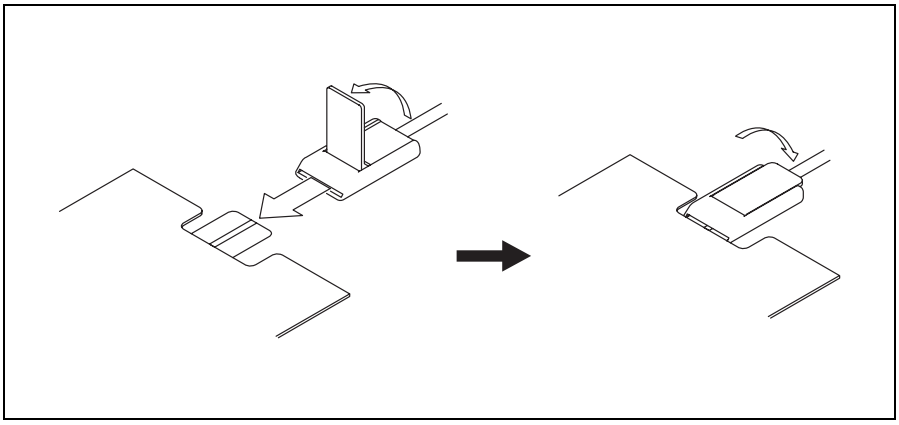


Figure 3.3

3. Fully insert the unit side plug of the P cord into the patient plate connector on the front panel of the electrosurgical unit (see Figure 3.4).

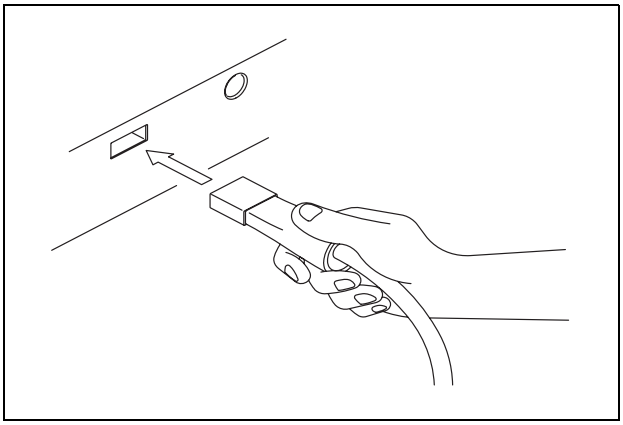


Figure 3.4

4. When a split-type patient plate is connected, verify that the CQM indicator is illuminated after the electrosurgical unit is turned ON.

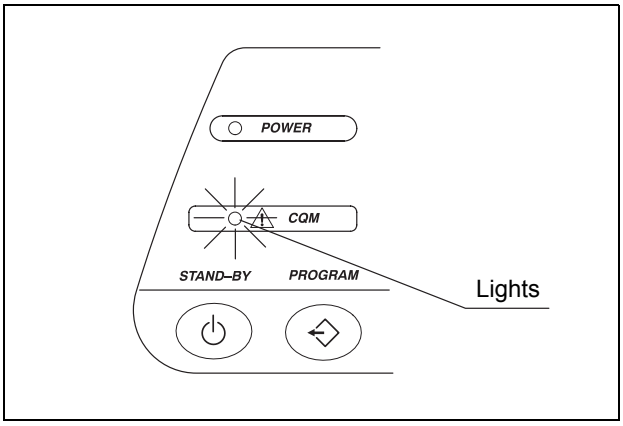


Figure 3.5

When using the P-plate (MB-574)

WARNING

Do not use a P-plate (MB-574) that is cracked or bent. This may cause patient burns.

1. Confirm that the P-plate is free of cracks or bends.
2. Confirm that the cable of the P adapter (MAJ-812) and the P cord (MAJ-3) are free of cracks and other damage.
3. Confirm that the plug on the unit side and the plug on the patient plate side of the P adapter are free of cracks and other damage.
4. Insert the plug on the patient plate inside of the P cord into the terminal of the P-plate and turn the Clamping ring clockwise to tighten it securely.

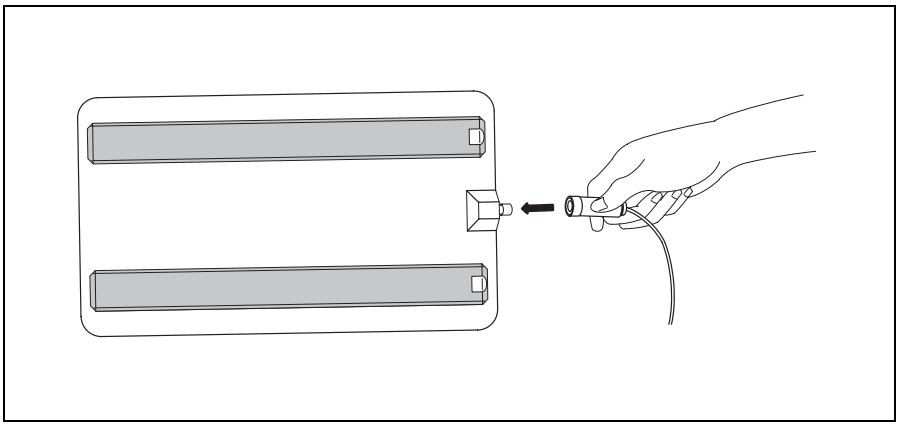


Figure 3.6

5. Moisten gauze pads slightly larger than the P-plate with physiological saline or conductive paste (e.g., Conductive Gel#1145, 3M) and place the gauze pads on the P-plate. Attach the P-plate to the patients thigh or calf with the Fastening Band, or lay it under the hip and check to see that it is always moistened.
6. Insert the plug of the unit side of the P adapter firmly into the patient plate connector on the front panel of PSD-30.

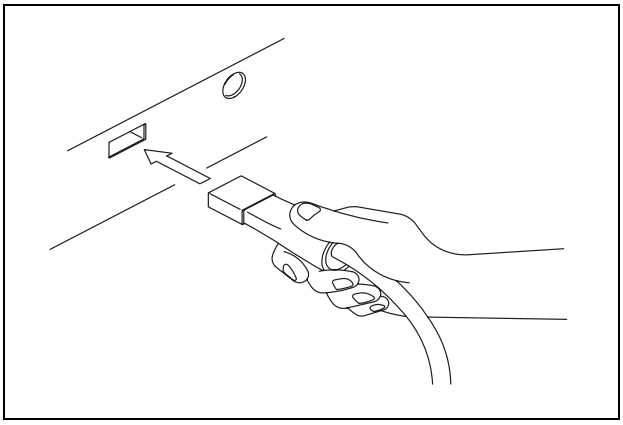


Figure 3.7

7. Insert the P cord connector of the P adapter into the plug on the unit side of the P cord.

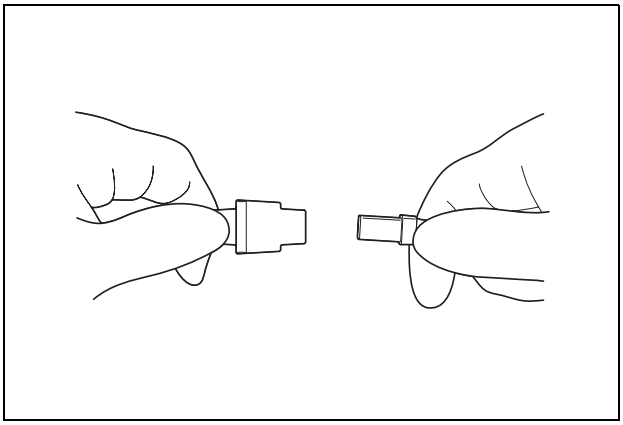


Figure 3.8

NOTE

When using the PSD-30 with the endoscope that is capable of high frequency cauterization and do not have the S-cord connector mount, use the non-split type patient plate.
If the split type patient plate is used, the patient/S-cord warning indicator may light and the alarm may sound according to the grounding conditions.

3.5 Connection of the S-cord (when using an endoscope with a S-cord connector mount)

WARNING

Connect the S-cord (MAJ-813) firmly between the S-cord connector on the front panel and the S-cord connector mount of the endoscope. Otherwise, the high frequency may not be output during treatment and, in this case, mechanical tissue cutting by the electrosurgical accessory may occur and cause bleeding or perforation of the patient.

1. Confirm that the S-cord is free of scratches and cracks.
2. With the arrow mark on the S-cord's plug on the unit side facing upward, insert the plug into the S-cord connector on the electrosurgical unit front panel, until it clicks (see Figure 3.9).

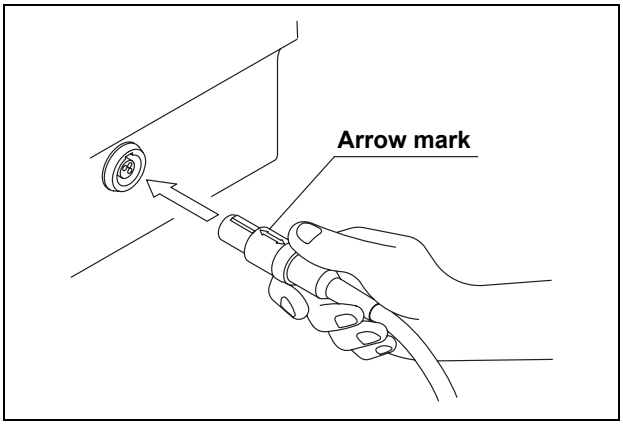


Figure 3.9

3. Connect the S-cord's plug on the endoscope side to the S-cord connector mount on the endoscope.

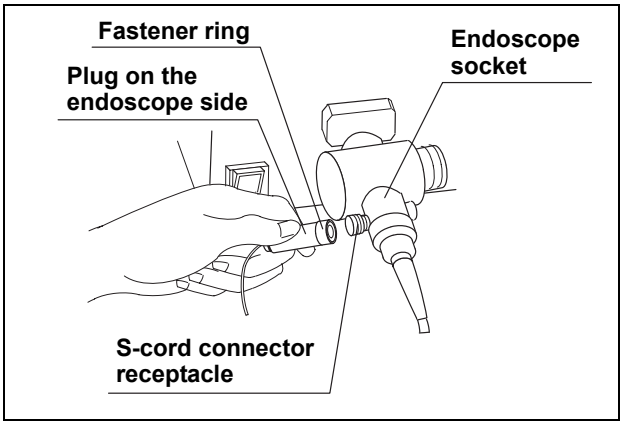


Figure 3.10

NOTE

- When the electrosurgical unit is ON and improper connections have been made in Step 3. above, an alarm will sound and the patient/S-cord warning indicator will flash. Reconnect the S-cord.
- Applicable endoscopes are limited to Olympus endoscopes suitable for electrosurgery. For details, refer to the instruction manual for the fiberscope or videoscope. If you have any questions concerning the applicability of your endoscope, please contact Olympus.

3.6 Connection of the A-cord

WARNING

- Use only Olympus endo-therapy accessories for fiberscopes or videoscopes. If other combinations are used, the full responsibility is assumed by the medical treatment facility. For details, refer to the instruction manual for the accessory. If you have any questions concerning the applicability of your accessory, please contact Olympus.
- Make sure that the A-cord (MA-255, MH-969) is not damaged before connecting it. Broken wires in the A-cord could cause reduced output/cutting performance, abnormal heating of the cord, bleeding, perforation and/or noise in the endoscopic image. If any of these conditions are observed, replace the A-cord with a new one.
- Securely connect the A-cord as described below. Otherwise, the high frequency may not be output during treatment and, in this case, mechanical tissue cutting by the electrosurgical accessory may occur and cause bleeding or perforation of the patient.

1. Confirm that the A-cord is free of scratches and cracks, and is not buckled, damaged or bent. Insert the A-cord plug into the active connector on the electrosurgical unit's front panel until it clicks (see Figure 3.11).

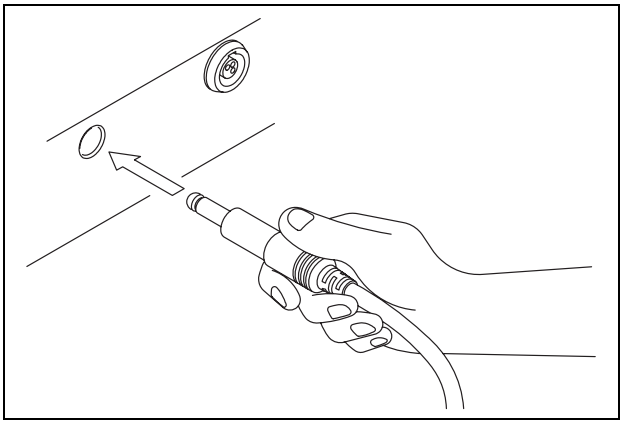


Figure 3.11

2. Attach the accessory side of the A-cord's plug to the fiberscope or videoscope accessory.

Chapter 4 Inspection

WARNING

Before each case, inspect this electrosurgical unit as instructed below. Inspect other equipment to be used with this electrosurgical unit as instructed in their respective instruction manuals. Should the slightest irregularity be suspected, do not use the electrosurgical unit and see Chapter 7, “Troubleshooting”. If the irregularity is still suspected, after consulting Chapter 7, contact Olympus. Damage or irregularity may compromise patient or user safety and may result in more severe equipment damage.

Prepare this electrosurgical unit and other equipment (shown in the “System chart” in the Appendix) to be used with this electrosurgical unit for each particular case. Refer to the respective instruction manual for each piece of equipment.

4.1 Inspection of the power supply

WARNING

If a sound is not heard after turning on the power switch, do not perform high-frequency cauterization.
The high-frequency output may not be noticed and patient injury, bleeding and/or perforation could result.

Press the power switch to turn ON the electrosurgical unit. Confirm that a sound is heard. At the same time all the indicators turn on and then turn off, and then the coagulation mode indicators, warning indicators and cut mode indicators should light alternately (see Figure 4.2). Then the power switch illuminates (see Figure 4.1) and the cut mode indicators and coagulation mode indicators should flash sequentially.

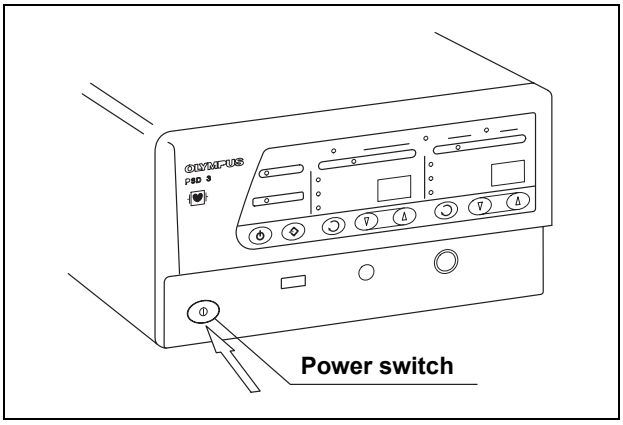


Figure 4.1

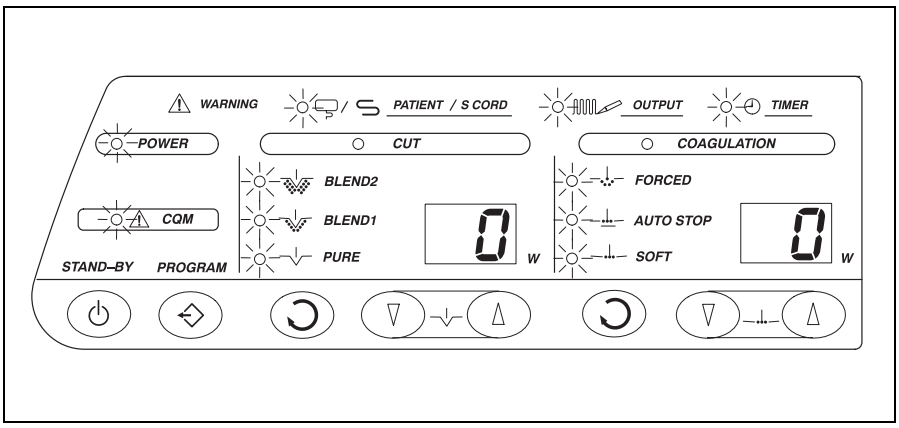


Figure 4.2

If the power fails to come on

If the power fails to come on, inspect the system as follows:

1. Confirm that the power cord is connected securely to a wall mains outlet and the AC power inlet on the electrosurgical unit.

WARNING

Turn the electrosurgical unit OFF and remove the power cord from the AC power inlet on the electrosurgical unit before removing the fuse box. Otherwise, fire or electric shock may result.

2. Turn the electrosurgical unit OFF and disconnect the power cord from the wall mains outlet.
3. Remove the fuse box from the electrosurgical unit by squeezing the tabs on the sides of the fuse box and pulling it straight out (see Figure 4.3).

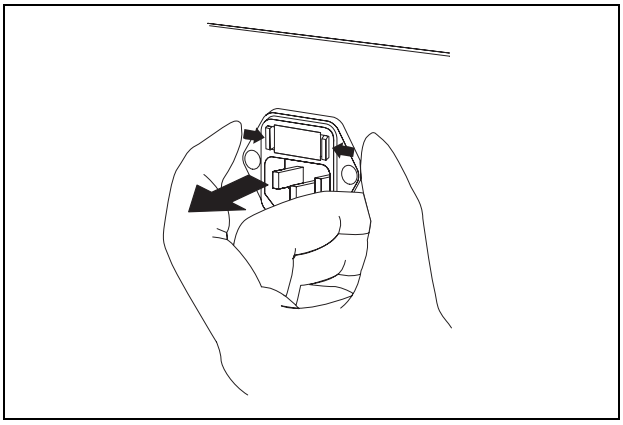


Figure 4.3

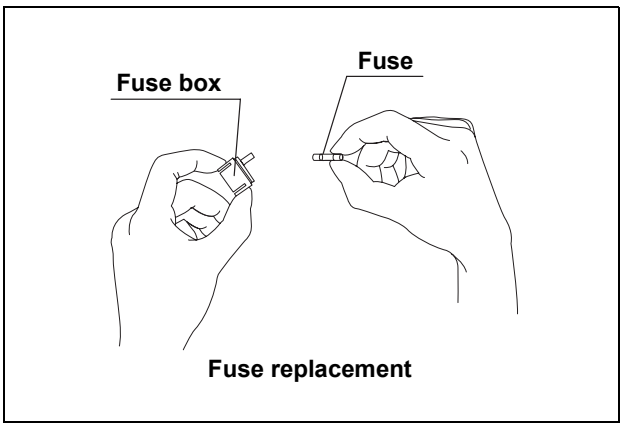


Figure 4.4

4. Inspect both fuses.

WARNING

Use only the fuses listed below. Otherwise, fire or equipment damage can result.

Olympus	MAJ-1052
Littel	2183.15

5. Even if only one fuse has blown, always replace both of them (see Figure 4.4).
   If both fuses have not blown, contact Olympus.
6. Insert the fuse box into the electrosurgical until it clicks into position.
7. Reconnect the power cord and press the power switch. Confirm that the power switch is lit.

WARNING

If the power fails to come on after replacing the fuses with new ones, immediately turn the electrosurgical unit OFF. Remove the power cord from the wall mains outlet and contact Olympus. Equipment damage or malfunction may have occurred and fire or electric shock can result.

4.2 Inspection of the foot switch

WARNING

A malfunctioning foot switch could result in continuous high-frequency output, which could cause injury to the patient and/or operator. Also, high-frequency output may not activated. In this case, the electrosurgical accessory could cut the tissue mechanically, which could cause bleeding and/or perforation to the patient.

To inspect the operation of the foot switch, press the cut pedal and coagulation pedal individually after the electrosurgical unit is turned ON and confirm that an alarm will sound and the output setting indicators (“FL” and “FS”) shown in Figure 4.5 will light with both pedals. If pedal is released, alarm sound and indicators are turned off. If not, the foot switch pedal may be defective. Replace the foot switch.

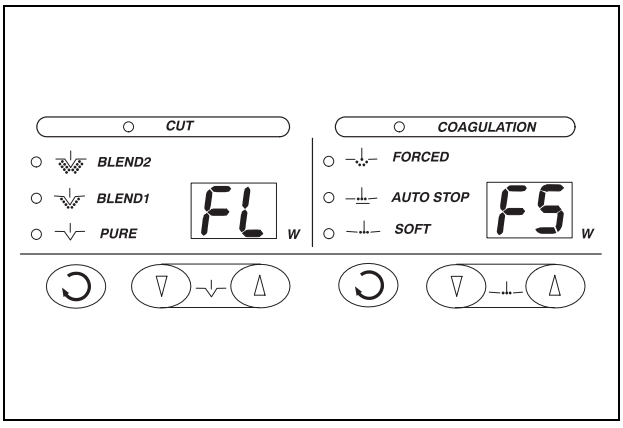


Figure 4.5

4.3 Inspection of the warning functions

WARNING

Before performing high-frequency cauterization, confirm that the unit's warning functions are working properly. Otherwise, abnormalities in the unit could go undetected and patient injury, burns, bleeding and/or perforation could result.

❍ Inspection of the patient plate warning

1. Disconnect the P cord plug from the patient plate connector on the front panel of the electrosurgical unit.
2. Confirm that the patient/S-cord warning indicator lights up and the warning alarm is heard and the indicators shown in Figure 4.6 light.

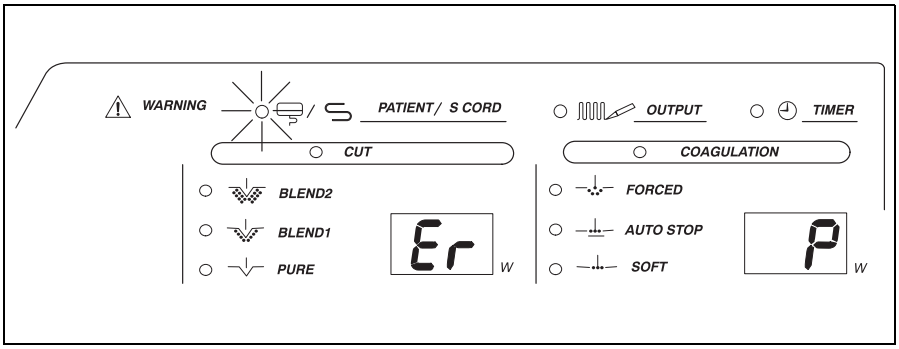


Figure 4.6

3. Re-insert the patient plate plug into the patient plate connector on the front panel and confirm that the warning indicator and the warning alarm go off.
4. When a split-type patient plate is used, confirm that the CQM indicator lights. The CQM indicator only lights when the contact between the patient place and the skin of the patient is correct.

❍ Inspection of S-cord warning (when using an endoscope equipped with a S-cord connector mount)

1. Disconnect the S-cord's plug on the endoscope side from the S-cord connector mount on the endoscope.
2. Confirm that the patient/S-cord warning indicator flashes and the warning alarm is heard and the indicators shown in Figure 4.7 light.

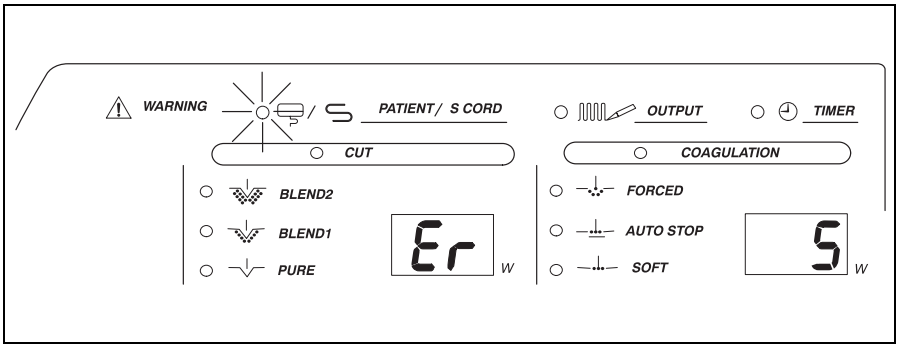


Figure 4.7

3. Re-connect the S-cord's plug on the endoscope side to the S-cord connector mount on the endoscope and confirm that the warning indicator goes off and the warning alarm stops.

4.4 Inspection of the cut mode and output

1. Confirm that each time the cut mode selector is pressed, the cut mode indicators are changed, and the corresponding indicators the "PURE", "BLEND1" or "BLEND2" cut mode light (see Figure 4.8).

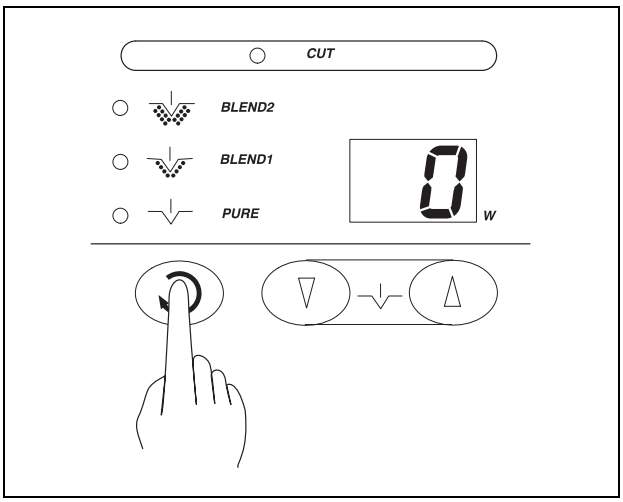


Figure 4.8

2. Press one of the "CUT" output control buttons. Confirm that the value shown on the cut output setting indicator increases or decrease each time the button is pressed (see Figure 4.9).

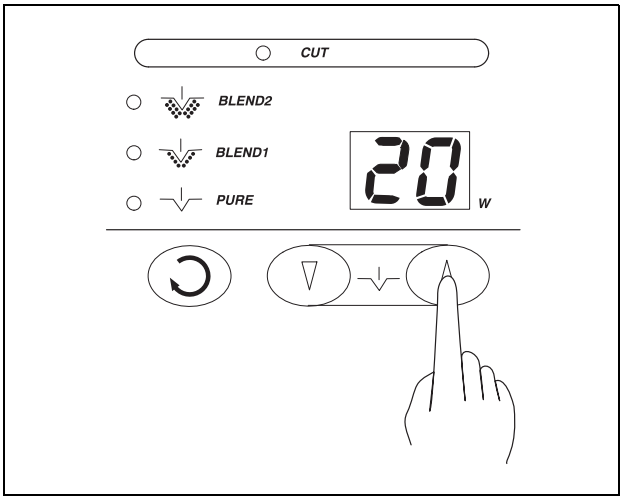


Figure 4.9

3. Confirm that the output level can be changed in sequences by pressing the button. The output level starts at 0 W. Pressing the button once, will change the output level to 2 W. Pressing it again changes the output level to 5 W. After 5 W setting, the output level can be changed in 5 W sequences and increased to 50 W. To decrease the output, press the button with the arrow pointing down.

4.5 Inspection of the coagulation mode and output

1. Confirm that each time the coagulation mode selector is pressed, the coagulation mode indicators are changed, and the corresponding indicators the “SOFT”, “AUTO STOP” or “FORCED” coagulation mode light (see Figure 4.10).

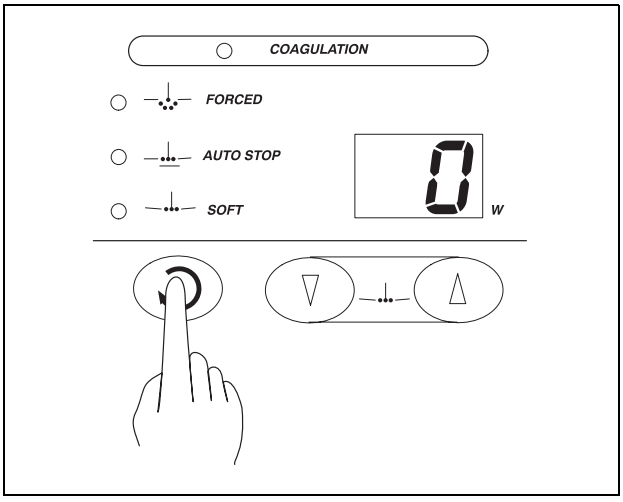


Figure 4.10

2. Press one of the “Coagulation” output control buttons. Confirm that the value shown on the coagulation output setting indicator increases or decrease.

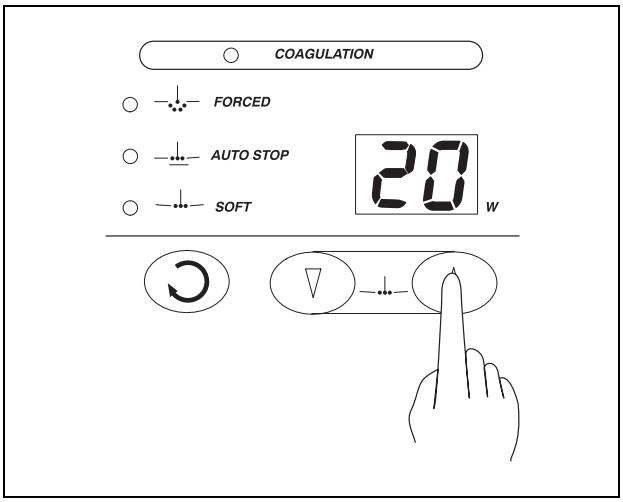


Figure 4.11

3. Confirm that the output level can be changed in sequences by pressing the button. The output level starts at 0 W. Pressing the button once, will change the output level to 2 W. Pressing it again changes the output level to 5 W. After 5 W setting, the output level can be changed in 5 W sequences and increased to 50 W. To decrease the output, press the button with the arrow pointing down.

Chapter 5 Operation

This unit must be used by a physician who has been sufficiently trained by the facility in clinical endoscopic techniques, cutting and coagulation of living tissue, and emergency treatment. This manual, therefore, does not explain or discuss these issues. Detailed evaluations of these issues should be made by those who have received such training.

DANGER

The HF equipment, when applied to a patient with a pacemaker implanted, may cause malfunctioning or failure of the pacemaker and may seriously affect the patient. Always confirm that it is safe to proceed with a cardiologist and the manufacturer of the pacemaker before proceeding.

WARNING

- Use only Olympus endo-therapy accessories for fiberscopes or videoscopes. If other combinations are used, the full responsibility is assumed by the medical treatment facility. For details, refer to the instruction manual for the accessory. If you have any questions concerning the applicability of your accessory, please contact Olympus.
- Wear personal protective equipment to guard against dangerous chemicals and potentially infectious material. During operation, wear appropriate personal protective equipment, such as eye wear, face mask, moisture-resistant clothing and chemical-resistant waterproof gloves that fit properly and are long enough so that your skin is not exposed.
- Precautions for incision of mucous membrane
  - When performing marking, set the output level and output time to the lowest necessary limits at which safe marking is possible. Otherwise, perforation and/or bleeding may result.
  - To prevent patient burns, be sure that you see the tip of the electrosurgical accessory in the endoscopic image during output.
  - Do not output while the tunica muscularis are snared. Otherwise, perforation and/or bleeding may result.

  - When cutting a mucous membrane, set the output level and output time to the lowest necessary limits at which safe cutting is possible. Otherwise, perforation may result. It is recommended that you perform basic experiments before using the electrosurgical unit.
  - When performing coagulation, set the output level and output time to the lowest necessary limits at which safe coagulation is possible. Otherwise, perforation may result. It is recommended that you perform basic experiments before using the electrosurgical unit.
- Precautions for endoscopic papillotomy
  - Set the output level and output time to the lowest necessary limits at which safe cutting is possible. Otherwise, perforation and/or bleeding may result.
  - Confirm that electricity is supplied to the accessory when making an incision. Incision without electricity may result in perforation and/or bleeding.
  - Use only the cutting mode. Using the coagulation mode may result in perforation and/or damage to the accessory.
- Precautions for hot biopsy
  - Set the output level and output time to the lowest necessary limits at which safe cutting is possible. Otherwise, perforation and/or bleeding may result.
  - Do not output while the metal portion of the hot biopsy forceps is in contact with a tissue in other part that the position where it grasps the tissue. Otherwise, perforation and/or burns to the tissue in contact may result.
  - Do not apply the cup of the hot biopsy forceps to the tissue but pull the tissue sufficiently to avoid perforation.
  - If the biopsy tissue cannot be cut, check the tissue contact condition and output setting again. Note that setting an excessive output level may result in perforation and/or bleeding.

5.1 Turn the power ON

Confirm that the accessories for the procedure have been connected correctly as described in Chapter 3, “Installation and Connection” and turn the electrosurgical unit ON.

5.2 Selection of cut mode

Pressing the cut mode selector on the front panel, selects the appropriate cut mode (“PURE”, “BLEND1” or “BLEND2”) for the type of surgery to be performed and the accessories to be used. Figure 5.1 shows the display with the pure mode selected.

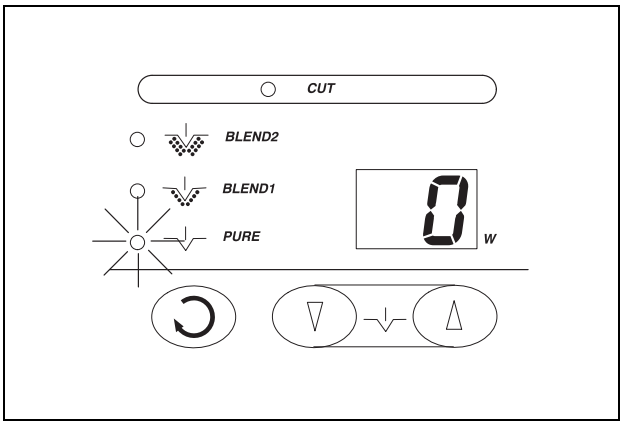


Figure 5.1

The “PURE”, “BLEND1” and “BLEND2” modes have the following characteristics:

PURE:	Cut wave-form containing virtually no hemostatic elements.
BLEND1:	Cut wave-form containing some hemostatic elements.
BLEND2:	Cut wave-form containing more hemostatic elements than BLEND1.

NOTE

- Output is disabled until both cut and coagulation modes are selected.
- The cut mode selecting cannot be changed while output is activated.

5.3 Selection of coagulation mode

Pressing the coagulation mode selector on the front panel, selects the appropriate coagulation mode (SOFT, AUTO STOP or FORCED) for the type of surgery and accessories to be used. Figure 5.2 shows the display with the soft mode selected.

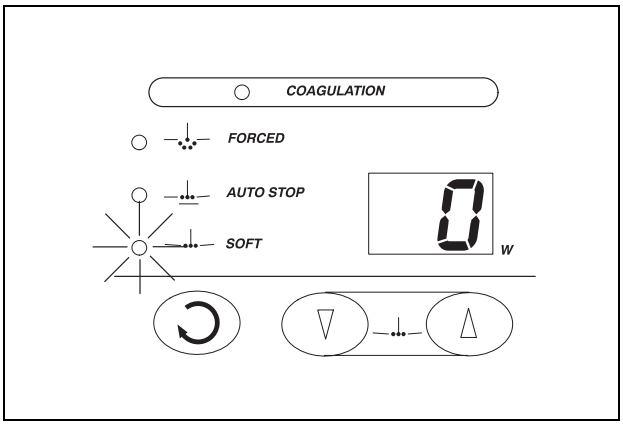


Figure 5.2

The “SOFT”, “AUTO STOP” and “FORCED” coagulation modes have the following characteristics:

SOFT:	To stop light bleeding, as well as mark tissue using snares. Very little tissue carbonization occurs in this mode.
AUTO STOP:	To reduce tissue carbonization and invasion, output is automatically stopped when a certain degree of coagulation has been reached during SOFT coagulation.
FORCED:	Comparatively strong coagulation and hemostatic effects.

NOTE

- Output is disabled until both cut and coagulation modes are selected.
- The coagulation mode selecting cannot be changed while output is activated.

5.4 Setting output

WARNING

Use the lowest appropriate output level to achieve the desired effect. Inappropriate output can cause burns to the patient and/or operator, patient bleeding and/or perforation. It is recommended to do appropriate examination before using to human body.

Press the “CUT” and “COAG.” output control buttons to set the output levels (see Figures 5.3 and 5.4).

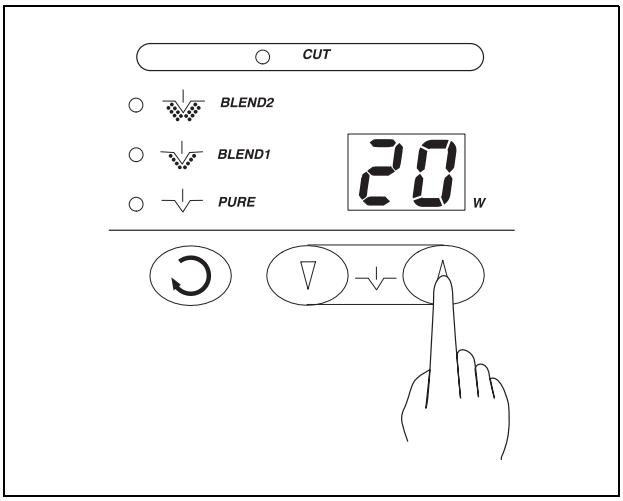


Figure 5.3

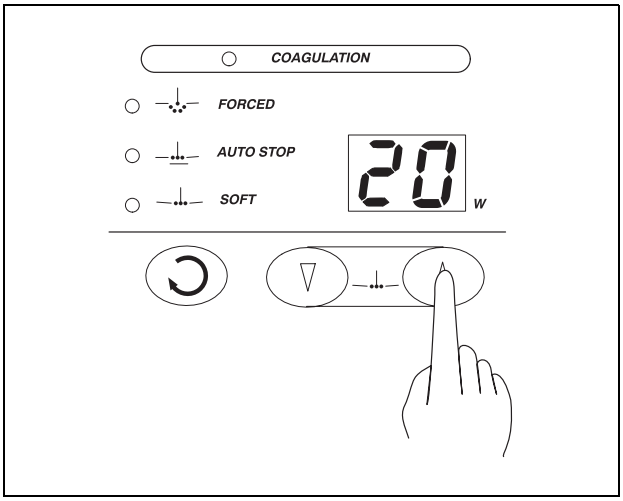


Figure 5.4

NOTE

- If the CUT and/or COAG. output level is set to “0 W” and the foot switch is pressed, a warning tone will sound and the output setting indicators will display “FL” and “FS” (see Figure 5.5).

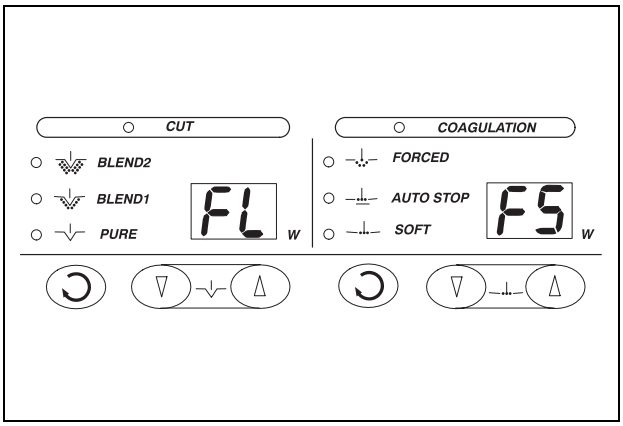


Figure 5.5

- The output level cannot be changed while output is activated.
- The maximum possible output level is 50 W in all output modes.

5.5 Program mode

This electrosurgical unit is capable of storing the output setting, cut mode and coagulation mode in memory. When the stored output setting, and cut mode and coagulation mode are retrieved, pressing the program switch will automatically recall them.

❍ Storing the output setting, cut mode and coagulation mode

1. Set the output setting, cut mode and coagulation mode as described in Section 5.2, “Selection of cut mode”, 5.3, “Selection of coagulation mode” and 5.4, “Setting output”.

2. Press the program switch. A short beep is generated and the output setting, cut mode and coagulation mode set in step 1. will be stored in memory (see Figure 5.6).

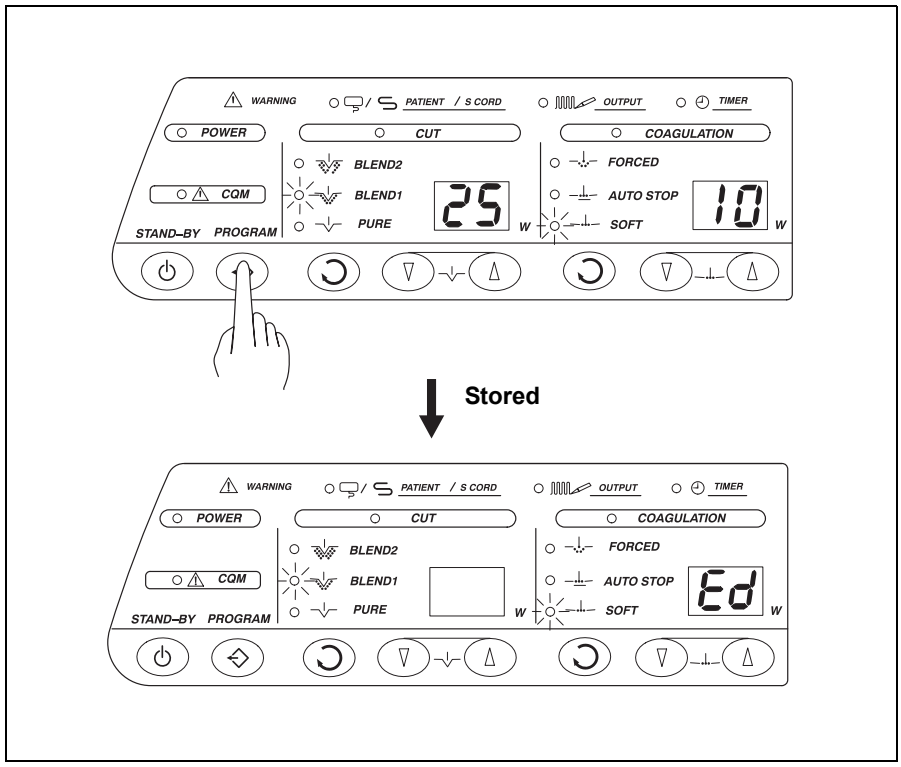


Figure 5.6

NOTE

The above operation erases the previous output setting, cut mode and coagulation modes.

Retrieving the output setting, cut mode and coagulation mode

1. Press the program switch, when the electrosurgical unit is turned ON and the cut mode and coagulation mode indicators are flashing (see Figure 5.7). The stored cut mode, coagulation mode and output setting will be displayed and a short beep is generated (see Figure 5.8).

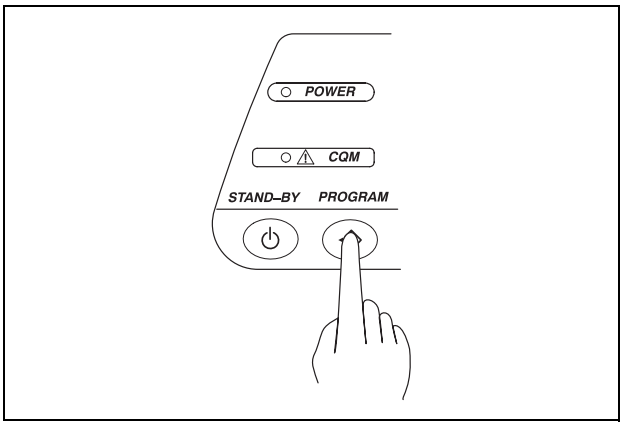


Figure 5.7

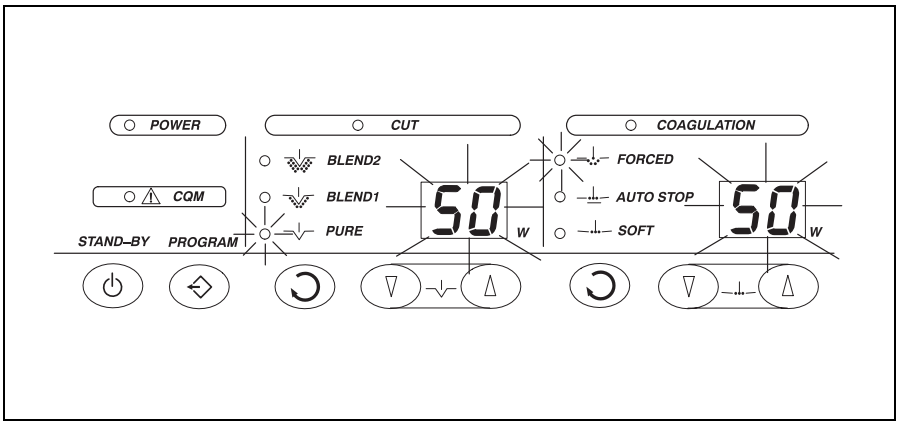


Figure 5.8

2. If the program switch is pressed and no settings are stored in the memory, an error message “EE” will be displayed on the coagulation output setting indicator. Perform setup as described in Section 5.2, “Selection of cut mode”, Section 5.3, “Selection of coagulation mode” and Section 5.4, “Setting output”.

5.6 Electrosurgery

WARNING

- To prevent patient burns, perforation and bleeding, be sure that you see the tip of the electrosurgical accessory in the endoscopic image during output.
- Do not bring the tip of the electrosurgical accessory close to a metal clip or other accessories. The tissue around the metal clip or the accessory may be burned.
- If output is not required, keep the operator's foot away from the pedal to prevent accidental output. Otherwise, it may cause operator and/or patient burns.
- When the foot switch is not operated and the output indicator lights or the output sound is heard, immediately stop the procedure, turn the electrosurgical unit OFF. Otherwise, it may cause perforation, bleeding and operator and/or patient burns.
- Do not increase the unit's output if a function is not working as expected; doing so could cause patient injury, burns, bleeding and/or perforation. In this case, inspect the cord connections, the contact of the patient plate and the settings of the electrosurgical unit for any abnormalities.
- Perform the countermeasures described in Section 7.1, "Troubleshooting guide". If output is still not activated, use a spare electrosurgical unit.
- Be sure that the pedal you intend to press is correct pedal before pressing the pedal. Otherwise, it may cause perforation, bleeding and patient burns.
- If the output does not stop when the operator's foot is released from the foot switch pedal, immediately turn the electrosurgical unit OFF to prevent patient burns, perforation and bleeding.

CAUTION

- Short-circuiting electrodes (accessories/hand piece and patient plate) while current is activated will cause the electrosurgical unit to malfunction.

- Patients may feel a neuromuscular stimulus when discharge occurs in the coagulation output mode or when there is a spark discharge to the forceps or another metallic object. The neuromuscular stimulus is caused by low-frequency components generated by rectification during discharging. To prevent this, minimize the discharge by selecting a lower output setting or by activating output when the electrode is in contact with the tissue to be cauterized.

1. Confirm that the settings on the front panel are correct and also confirm that the foot switch pedal is correct before activating the output.
2. By pressing the CUT pedal, cut output will occur. By pressing the COAG pedal, coagulation output will occur.
3. Output will take place while the foot switch is pressed. During output, the output indicator will light and the output sound will be heard. Output will stop when the switch is released. However, if the AUTO STOP mode is selected, coagulation output will stop automatically while the pedal is pressed (see Figure 5.9).

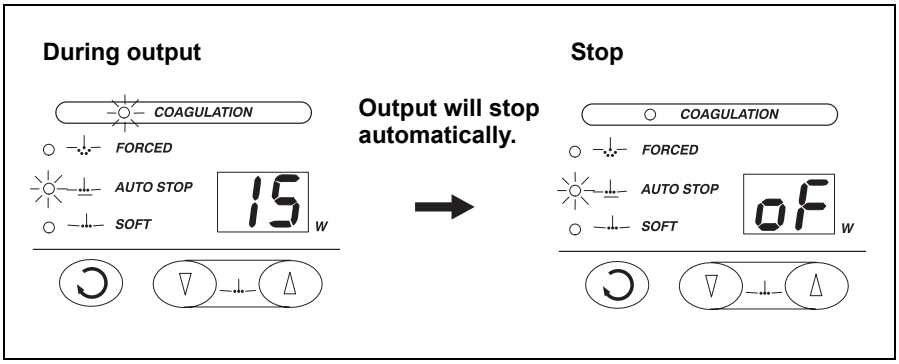


Figure 5.9

NOTE

- The output controlled by the first pedal pressed will be activated. Furthermore, when both pedals are pressed simultaneously no output power is resulted and the output setting indicators will be displayed as shown Figure 5.10.

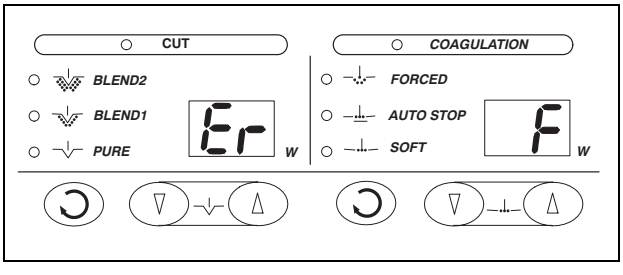


Figure 5.10

- Panel settings cannot be changed while output is activated.
- The sound volume can be adjusted as described in Section 5.8, “Adjusting the volume”. The sound serves as an important reminder while output is activated and the sound should always be audible. The volume of the warning alarm is not adjusted.
- The maximum output time should be 10 seconds and there should be an interval of 30 seconds between outputs.
- No power output is possible when the electrosurgical unit is in the stand-by mode. To operate the electrosurgical unit, release the stand-by mode as described in Section 5.7, “Stand-by mode”.
- When using the PSD-30 with the endoscope that is capable of high frequency cauterization and do not have the S-cord connector mount, use the non-split type patient plate.
  If the split type patient plate is used, the patient/S-cord warning indicator may light and the alarm may sound according to the grounding conditions.

5.7 Stand-by mode

If output is not required for a long period while the electrosurgical unit remains ON, it is recommended that you activate the stand-by mode to prevent accidental output. In the stand-by mode, output is disabled even if the foot switch pedals are pressed.

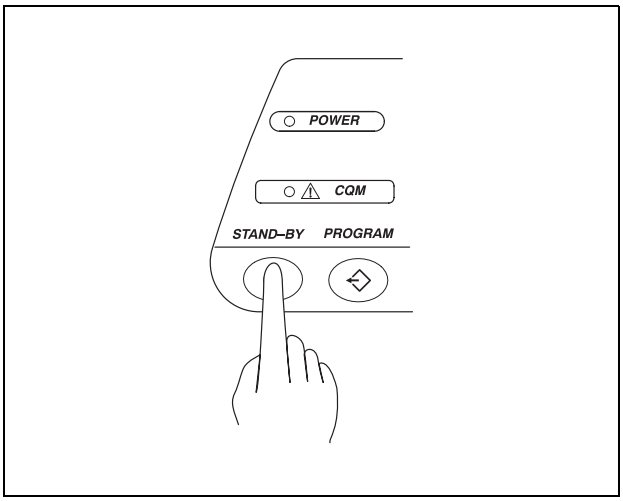


Figure 5.11

❍ Activating the stand-by mode

When the stand-by switch is pressed for one second, the output setting indicators display characters as shown in Figure 5.12. The stand-by mode is activated.

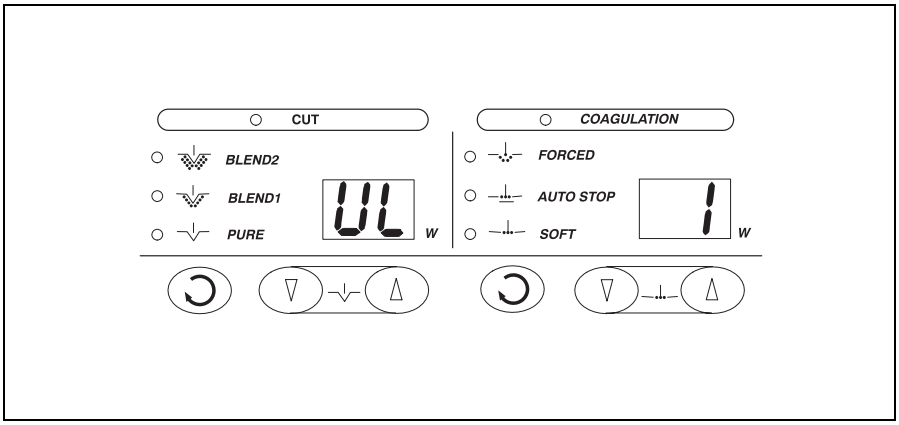


Figure 5.12

NOTE

- In the stand-by mode, all output adjustments and change of settings are disabled.
- The output tone volume can be adjusted only in the stand-by mode.
- The stand-by mode can only be activated after all settings are made.

❍ Cancelling the stand-by mode

When the stand-by switch is pressed for one second, the stand-by mode is cancelled. Various output setting, cut mode and coagulation mode are enabled. The previously set values are displayed.

5.8 Adjusting the volume

WARNING

The output tone volume can be adjusted in four steps. Since the output tones play an important role of noticing the output, do not lower the volume down to the inaudible area. If the output tone is inaudible, high-frequency output may not be detected by the user. This could cause patient injury.

1. Put the electrosurgical unit in the stand-by mode as described in Section 5.7, “Stand-by mode”.
2. Confirm that the numbers 1 to 4 are displayed on the coagulation output setting indicator. The larger the number, the larger the output tone volume.
3. Press the “▲” segment of the output control button on the COAG. side to increase the displayed number (see Figure 5.13). Press the “▼” segment to decrease the displayed number.

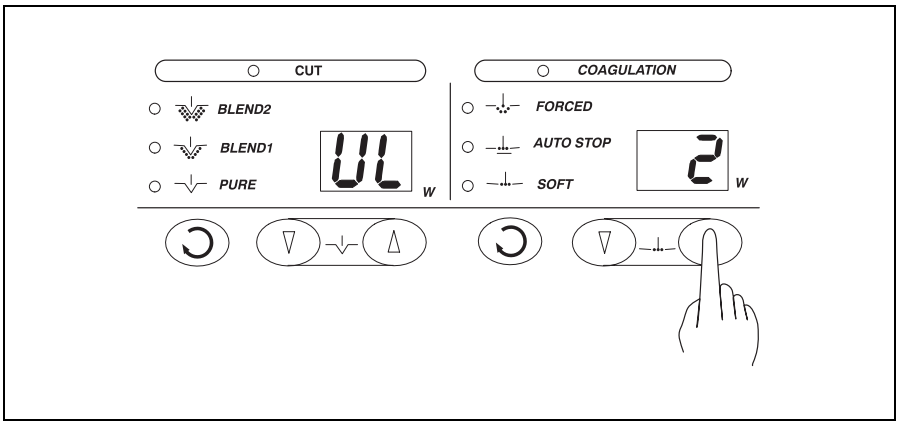


Figure 5.13

4. After completing the adjustment, cancel the stand-by mode as described in Section 5.7, “Stand-by mode”.

NOTE

- The output tone volume can be adjusted only in the stand-by mode.
- The alarm tone volume cannot be adjusted.

5.9 Procedure after use

WARNING

- Always discard used disposable patient plates. Never attempt to reprocess or reuse them. It may cause patient burns.
- Do not use the P cord as a tool to remove the patient plate from the patient. If utilized in this fashion, skin injuries can occur.

❍ When using the disposable patient plate

CAUTION

When disconnecting the plug on the unit side of the P cord (MAJ-814) or patient plate, always hold the plug on the unit side or patient plate clamp. Pulling the cable may result in damaging of the wires.

1. Turn the electrosurgical unit OFF.
2. Remove the patient plate from the patient and disconnect the patient plate plug from the patient connector on the front panel.
3. Disconnect the A-cord's plug on the accessory side from the accessory for the endoscope. Disconnect the A-cord's plug on the unit side from the active connector on the front panel.
4. Following endoscopic treatment, disconnect the S-cord's plug on the endoscope side from the endoscope's S-cord connector mount. Pull the ring on the S-cord's plug outward and disconnect the S-cord from the S-cord connector on the front panel (for an endoscope equipped with the S-cord connector mount).
5. When the foot switch is no longer needed, rotate the fastener ring on the foot switch plug counterclockwise and disconnect the plug from the foot switch connector on the rear panel.
6. If the electrosurgical unit is not to be used for a long period, disconnect the power cord plug from the wall mains outlet.

When using the P-plate (MB-574)

CAUTION

When disconnecting each side of P cord (MAJ-3) and P adapter, always hold the plug on the unit side or patient plate clamp. Pulling the cable may result in the breaking of the wires.

1. Turn the electrosurgical unit OFF.
2. Remove the patient plate from the patient.
3. Rotate the Clamping Ring of the P cord counterclockwise and disconnect.
4. Disconnect the plug on the unit side of the P cord from the P cord connector of the P adapter. Disconnect the plug on the unit side of P adapter from the Patient connector on the front panel.
5. Disconnect the A-cord's plug on the accessory side from the accessory for the endoscope. Disconnect the A-cord's plug on the unit side from the Active connector on the front panel.
6. Following endoscopic treatment, disconnect the S-cord's plug on the endoscope side from the endoscope's S-cord connector mount. Pull the ring on the S-cord's plug outward and disconnect the S-cord from the S-cord connector on the front panel (for an endoscope equipped with the S-cord connector mount).
7. When the foot switch is no longer needed, rotate the fastener ring on the Foot switch plug counterclockwise and disconnect the plug from the Foot switch connector on the rear panel.
8. If the electrosurgical unit is not to be used for a long period, disconnect the power cord plug from the wall mains outlet.

Chapter 6 Care, Storage and Disposal

After each use, perform the following cleaning procedures immediately. If cleaning is delayed, debris encrustation may become a source of infection. Encrustation may also result in electrosurgical unit malfunction.
For maintenance and storage of other optional items than those described below, refer to the respective instruction manuals.

6.1 Care

WARNING

- After cleaning the electrosurgical unit, dry it thoroughly before using it again. If it is used while still wet, there is the risk of an electric shock.
- Patient debris and reprocessing chemicals are hazardous. Wear personal protective equipment to guard against dangerous chemicals and infectious material. During cleaning and disinfection, always wear appropriate personal protective equipment, such as eye wear, face mask, moisture-resistant clothing and chemical-resistant waterproof gloves that fit properly and long enough so that your skin is not exposed. Always remove contaminated protective clothing before leaving the reprocessing area.

CAUTION

- Never immerse the electrosurgical unit in water, clean or disinfect by immersion, gas sterilization or autoclaving. It may cause equipment damage.
- Do not clean the connectors or the AC power inlet. Cleaning them can deform or corrode the contacts, which could damage the electrosurgical unit.
- Do not wipe the external surface with hard or abrasive wiping material. The surface will be scratched.

1. Turn the electrosurgical unit OFF and disconnect the power cord from the receptacle (wall mains outlet).
2. If the equipment is soiled with blood or other potentially infectious materials, first wipe off all gross debris using neutral detergent, then wipe its surface with a lint-free cloth moistened with a surface disinfectant.

3. To remove dust, dirt and non-patient debris, wipe the electrosurgical unit and foot switch using a soft, lint-free cloth moistened with 70% ethyl or isopropyl alcohol.
4. Make sure that the electrosurgical unit and foot switch are completely dry before storage.

6.2 Storage

WARNING

Do not store the electrosurgical unit in their shipping cases. Storing these devices in the humid and unventilated environments of their shipping cases may encourage the growth of microorganisms and pose an infection control risk.

CAUTION

- Do not store the electrosurgical unit in a location exposed to direct sunlight, X ray, radioactivity, liquids or strong electromagnetic radiation (e.g. near microwave medical treatment equipment, short-wave medical treatment equipment, MRI equipment, radio or mobile phones). Damage to the electrosurgical unit may result.
- Do not apply excessive bending, straining, or squeezing force to any cords during storage. It may cause malfunction.

1. Disconnect the power cord.
2. Store the equipment at room temperature in the horizontal position in a clean, dry and stable location.

6.3 Disposal

When disposing of this electrosurgical unit, or any of its components (such as fuses), follow all applicable national and local laws and guidelines.

Chapter 7 Troubleshooting

If the electrosurgical unit is visibly damaged, does not function as expected or is found to have irregularities during the inspection as described in Chapter 3, “Installation and Connection” and Chapter 4, “Inspection”, do not use the electrosurgical unit. Contact Olympus.
Some problems that appear to be malfunctions may be correctable by referring to Section 7.1, “Troubleshooting guide”. If the problem cannot be resolved by the described remedial action, stop using the electrosurgical unit and send it to Olympus for repair.
Olympus does not repair accessory parts. If an accessory part becomes damaged, contact Olympus to purchase a replacement.

DANGER

Never use the electrosurgical unit if an abnormality is suspected. The patient can be fatally or seriously injured.

7.1 Troubleshooting guide

The following table shows the possible causes and solutions for irregularities that may occur due to equipment setting failures or degradation of consumable items. The unit should only be repaired by Olympus-qualified personnel, or returned to Olympus for repair as described in Section 7.3, “Returning the electrosurgical unit for repair”.

When the FL code is displayed

Indication of the cut output setting indicator	Indication of the coagulation output setting indicator	Possible cause	Solution
FL	FS	The foot switch is short-circuited.	Replace the foot switch with a new one.
		• The cut mode is not selected. • The coagulation mode is not selected.	Select the cut mode or coagulation mode as described in Section 5.2, “Selection of cut mode” or 5.3, “Selection of coagulation mode”.
		The output level is set to 0 W.	Set the output level to a value above 0 W.
FL FL FL FL FL FL FL	SP Rd I U P9 PS S I	The electrosurgical unit is malfunctioning.	Immediately turn the electrosurgical unit OFF and contact Olympus.

When the Er code is displayed

Indication of the cut output setting indicator	Indication of the coagulation output setting indicator	Possible cause	Solution
Er	P	• The wires of the P cord are broken. • The P cord is connected incorrectly.	Connect the patient plate correctly as described in Section 3.4, “Connection of the patient plate”.
		• The patient plate is not in proper contact with the patient’s skin.	Reattach the patient plate or replace it with designated patient plate as described in Section 3.4, “Connection of the patient plate”.
		• The split type patient plate is used with the endoscope having no S-cord connector mount.	Use a non-split type patient plate.
Er	S	• The wires of the S-cord are broken. • The S-cord is connected incorrectly.	Connect the S-cord correctly as described in Section 3.5, “Connection of the S-cord (when using an endoscope with a S-cord connector mount)”.

Indication of the cut output setting indicator	Indication of the coagulation output setting indicator	Possible cause	Solution
Er	SP	• The wires of the P cord are broken and the wires of the S-cord are broken. • The wires of the P cord are broken and the S-cord is connected incorrectly. • The P cord is connected incorrectly and the wires of the S-cord are broken. • The P cord is connected incorrectly and the S-cord is connected incorrectly.	Connect the patient plate or the S-cord correctly as described in Sections 3.4, “Connection of the patient plate” and 3.5, “Connection of the S-cord (when using an endoscope with a S-cord connector mount)”.
		• The patient plate is not in proper contact with the patient’s skin and the wires of the S-cord are broken. • The patient plate is not in proper contact with the patient’s skin and the S-cord is connected incorrectly.	Reattach the patient plate or replace it with designated patient plate as described in Section 3.4, “Connection of the patient plate”. Also connect the S-cord correctly as described in Section 3.5, “Connection of the S-cord (when using an endoscope with a S-cord connector mount)”.
		• The split type patient plate is used with the endoscope having no S-cord connector mount and the wires of the S-cord are broken. • The split type patient plate is used with the endoscope having no S-cord connector mount and the S-cord is connected incorrectly.	Use a non-split type patient plate. Also contact the S-cord correctly as described in Section 3.5, “Connection of the S-cord (when using an endoscope with a S-cord connector mount)”.

Indication of the cut output setting indicator	Indication of the coagulation output setting indicator	Possible cause	Solution
Er	U	The output level deviates from the set level.	Stop the output immediately. Start the output again. If abnormal function still occurs the equipment is in need of service.
Er	S1	When an endoscope is used, any metal portion of the endoscope's distal end has come into contact with tissue.	Lift the distal end of the endoscope away from the tissue.
		When an endoscope is used, any metal portion of the endoscope's distal end has come into contact with tissue via bridging fluids.	Lift the distal end of the endoscope away from the tissue. Suction fluids around the target area.
		When an endoscope is used, any metal portion of the endoscope's distal end has come into contact with tissue.	Position the accessory in the vicinity of the target area, and move the endoscope away to the extend that the accessory tip remains visible in the field of view.
		The patient plate is in contact with metallic parts of the operation table or other units, etc.	Move the patient plate away from the metallic parts.
		Insufficient contact between the patient plate and the patient's skin.	Reattach the patient plate as described in Section 3.4, "Connection of the patient plate".
		When an endoscope is used, the tip of the accessory is not in contact with the lesion.	Set the output level to a value above 0 W.

Indication of the cut output setting indicator	Indication of the coagulation output setting indicator	Possible cause	Solution
Er	1	The patient plate is in contact with metallic parts of the operation table or other units, etc.	Move the patient plate away from the metallic parts.
		Insufficient contact between the patient plate and the patient's skin.	Reattach the patient plate as described in Section 3.4, "Connection of the patient plate".
		When an endoscope is used, the tip of the accessory is not in contact with the lesion.	Keep the tip in contact with the lesion.
Er	F	Both of the two pedals of the foot switch are pressed simultaneously.	Be sure to press only the required pedal of the foot switch.
Er	h	The internal temperature of the unit is excessively high.	The internal temperature of the unit is excessively high; wait a while till the temperature drops.
Er Er Er Er Er Er	dA EC EP EA Er Ed	Error in the internal data of the unit, etc.	Set power switch to OFF, then to ON. If the problem cannot be resolved, stop using the electrosurgical unit and contact Olympus.

When the FL, Er code is not displayed

Irregularity description	Possible cause	Solution
The power fails to come on.	The power cord is not connected.	Connect the power cord to a wall mains outlet as described in Section 3.2, “Connection to an AC mains power supply”.
	The electrosurgical unit is not turned ON.	Turn the electrosurgical unit ON.
	The fuses have blown.	Replace fuses with new ones as described in Section 4.1, “Inspection of the power supply”.
The indicators do not light.	The power cord is not connected.	Connect the power cord to a wall mains outlet as described in Section 3.2, “Connection to an AC mains power supply”.
	The electrosurgical unit is not turned ON.	Turn the electrosurgical unit ON.
	The fuses have blown.	Replace fuses with new ones as described in Section 4.1, “Inspection of the power supply”.
No output	The output level is set to 0 W.	Set the output level to a value above 0 W.
	The stand-by mode is activated.	Cancel the stand-by mode.
	The patient plate is not connected.	Connect the patient plate as described in Section 3.4, “Connection of the patient plate”.
	The patient plate or P cord has contact with metal.	Remove the patient plate or P cord from the metal.
	The patient plate is not in proper contact with the patient’s skin.	Reattach the patient plate.
	The wires of the P cord are broken.	Replace the P cord with a new one.
	The patient plate is not a designated type.	Replace it with a designated patient plate.
	The foot switch is not connected.	Connect the foot switch as described in Section 3.3, “Connection of the foot switch”.

Irregularity description	Possible cause	Solution
No output	The A-cord is not connected to the electrosurgical unit.	Connect the A-cord as described in Section 3.6, “Connection of the A-cord”.
	The A-cord is not connected to the accessory.	Connect the A-cord as described in Section 3.6, “Connection of the A-cord”.
	The wires of the A-cord are broken.	Replace the A-cord with a new one.
	The A-cord is not a designated type.	Replace it with a designated A-cord.
	The S-cord is connected incorrectly.	Connect the S-cord correctly as described in Section 3.5, “Connection of the S-cord (when using an endoscope with a S-cord connector mount)”.
	The wires of the S-cord are broken.	Replace the S-cord with a new one.
	When the S-cord is used, the tip of the accessory is not in contact with lesion during output.	Keep the tip in contact with the lesion.
The alarm sounds and output is inhibited.	The A-cord is not connected to the electrosurgical unit.	Connect the A-cord as described in Section 3.6, “Connection of the A-cord”.
	The A-cord is not connected to the accessory.	Connect the A-cord as described in Section 3.6, “Connection of the A-cord”.
Output continues.	The foot switch is short-circuited.	Immediately turn the electrosurgical unit OFF and replace the foot switch with a new one.
The panel settings are disabled.	The stand-by mode is activated.	Cancel the stand-by mode as described in Section 5.7, “Stand-by mode”.
The alarm sounds and the output setting indicators display “FL” and “FS”.	The foot switch is short-circuited.	Replace the foot switch with a new one.

Irregularity description	Possible cause	Solution
The high frequency output make alarm.	The patient plate or electrode is in contact with metal.	Remove the patient plate from the metal.
	The temperature in the electrosurgical unit rise high.	Reattach the patient plate as described in Section 3.4, “Connection of the patient plate”.
The patient/S-cord alarm continues.	The patient plate is not connected.	Turn off the power switch and cool down the unit.
	The patient plate is not in proper contact with the patient’s skin.	Reattach the patient plate as described in Section 3.4, “Connection of the patient plate”.
	The wires of the P cord are broken.	Replace the P cord with a new one.
	The patient plate is not designated type.	Replace it with a designated patient plate.
	The S-cord is connected incorrectly.	Connect the S-cord correctly as described in Section 3.5, “Connection of the S-cord (when using an endoscope with a S-cord connector mount)”.
	The wires of the S-cord are broken.	Replace the S-cord with a new one.
The patient feels neuromuscular stimulus.	Low-frequency components are generated by rectification during discharging.	Minimize the discharge by lowering the output setting or by activating the output when the electrode is in contact with the tissue to be cauterized.

NOTE

- For designated patient plates, refer to Section 3.4, “Connection of the patient plate”.
- For designated A-cords, refer to Section 3.6, “Connection of the A-cord”.

7.2 Alarm functions

Patient plate/S-cord connection error

Irregularity description	Possible cause	Solution
The patient/ S-cord warning indicator lights or flashes and the alarm sounds (see Figure 7.1).	• The wires of the P cord are broken. • The P cord is connected incorrectly.	Connect the P cord correctly as described in Section 3.4, “Connection of the patient plate”.
	• The wires of the S-cord are broken. • The S-cord is connected incorrectly.	Connect the S-cord correctly as described in Section 3.5, “Connection of the S-cord (when using an endoscope with a S-cord connector mount)”.
	The patient plate is not in proper contact with the patient’s skin.	Reattach the patient plate or replace it with designated patient plate as described in Section 3.4, “Connection of the patient plate”.
	The split type patient plate is used with the endoscope having no S-cord connector mount.	Use a non-split type patient plate.

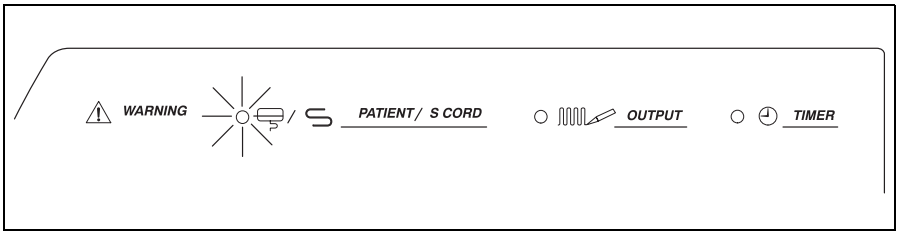


Figure 7.1

High frequency output error

Irregularity description	Possible cause	Solution
The high frequency output warning indicator lights, the alarm sounds and the high frequency output stops.	The output level deviates from the set level.	Stop the output immediately. Start the output again. If abnormal function still occurs the equipment is in need of service.
The high frequency output warning indicator lights for a while, then the alarm sounds and high frequency output stops.	When an endoscope is used, any metal portion of the endoscope's distal end has come into contact with tissue.	Lift the distal end of the endoscope away from the tissue.
	When an endoscope is used, any metal portion of the endoscope's distal end has come into contact with tissue via bridging fluids.	Lift the distal end of the endoscope away from the tissue. Suction fluids around the target area.
	When an endoscope is used, any metal portion of the endoscope's distal end is touching the diathermy accessory tip.	Position the accessory in the vicinity of the target area, and move the endoscope away to the extend that the accessory tip remains visible in the field of view.
	The patient plate is in contact with metallic parts of the operating table or other units, etc.	Move the patient plate away from metallic parts.
	Insufficient contact between the patient plate and the patient's skin.	Reattach the patient plate as described in Section 3.4, "Connection of the patient plate".
	When an endoscope is used, the tip of the accessory is not in contact with the lesion.	Bring the tip of the accessory in contact with the lesion.

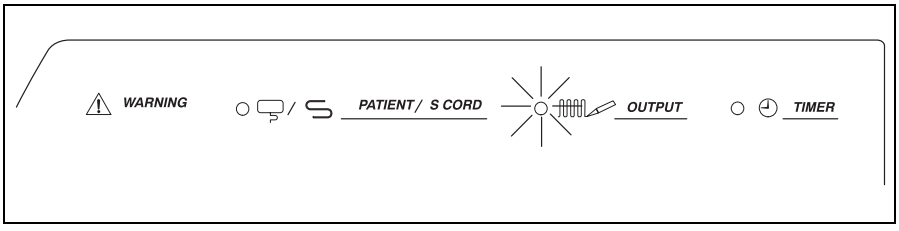


Figure 7.2

Output time error

Irregularity description	Possible cause	Solution
The output time warning indicator flashes and alarm sound is made.	The output continues for more than 15 sec.	Immediately stop the output. If the indicator remains light, turn the power OFF.
The output time warning indicator lights constantly and the alarm sounds intermittently with 5 second intervals. The high frequency output is stopped.	The output continues for more than 30 sec.	Immediately stop the output. If the indicator remains light, turn the power OFF.

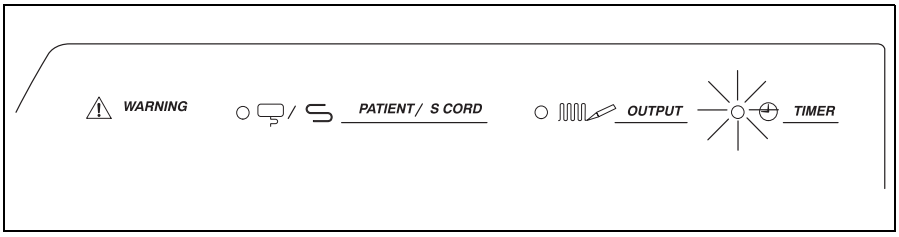


Figure 7.3

	More than 15 seconds	More than 30 seconds
Output time warning indicator	Flashes (The light of the indicator is off when foot switch is released.)	Lights (The light of the indicator is off when foot switch is released.)
Alarm sound	Enable (The alarm sound stops when the foot switch is released.)	Intermittently for 5 second intervals (The alarm sound stops when the foot switch pedal is pressed again).
High frequency output	Enable	Disable (The high frequency output enables when foot switch is pressed again.)

Foot switch short-circuit error

NOTE

This detection will be effective when the electrosurgical unit is turned ON until all output settings are completed. It does not work during output.

Irregularity description	Possible cause	Solution
The alarm sounds and the output setting indicators display “FL” and “FS” (see Figure 7.4).	The foot switch is short-circuited.	Replace the foot switch with a new one.

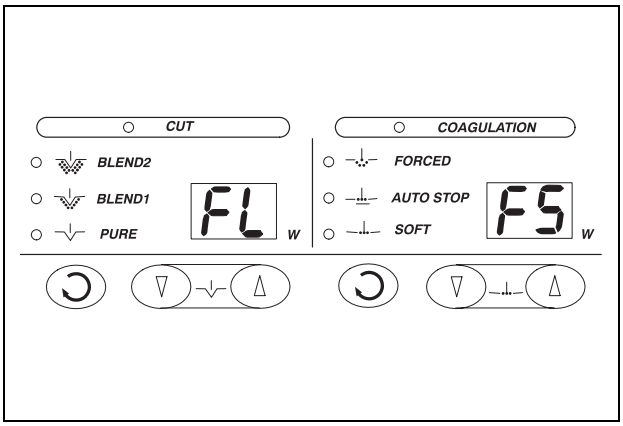


Figure 7.4

Self-check error

NOTE

The self-checking function is effective when output is not activated. It does not work during output.

Irregularity description	Possible cause	Solution
The alarm will sound and the indicators (“FL” and “Ad”) shown in Figure 7.5 flashes.	The alarm functions are malfunctioning.	Immediately turn the electrosurgical unit OFF and contact Olympus.

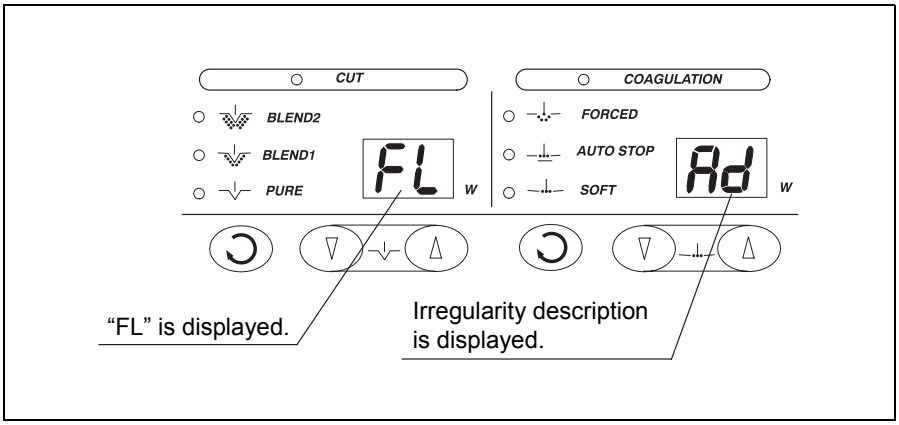


Figure 7.5

7.3 Returning the electrosurgical unit for repair

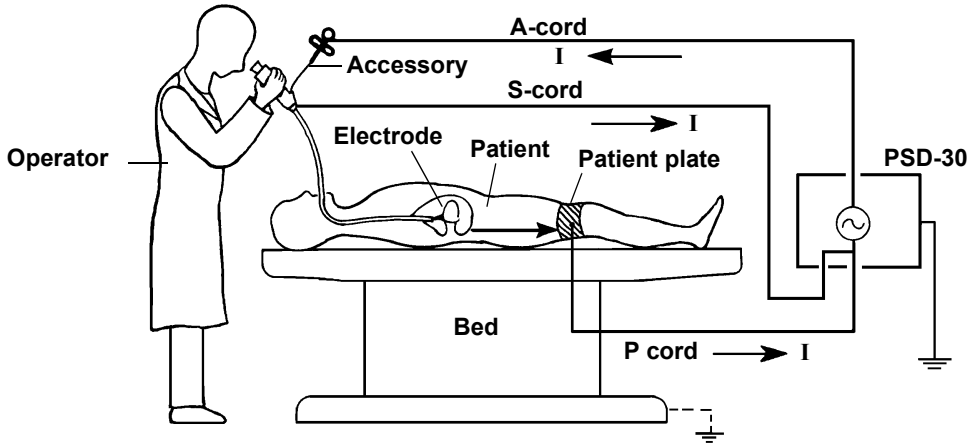
Before returning the electrosurgical unit for repair contact Olympus. With the electrosurgical unit, include a description of malfunction or damage and the name and telephone number of the individual at your location who is most familiar with the problem. Also include a repair purchase order.

Appendix

Construction

Schematic

- **Monopolar**



I : High frequency current

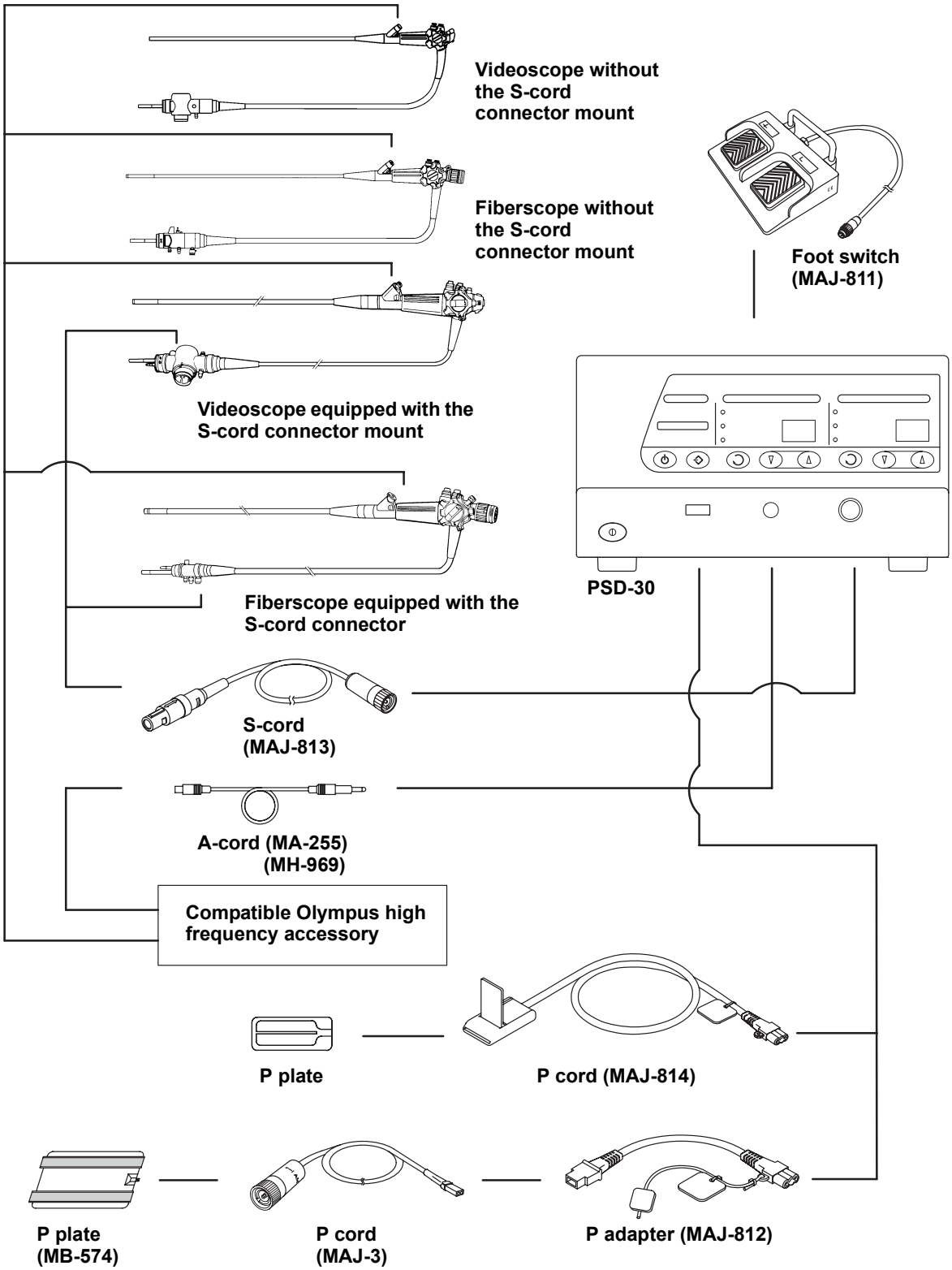
System chart

The recommended combinations of equipment and accessories that can be used with this electrosurgical unit are listed below. New products released after the introduction of this electrosurgical unit may also be compatible for use in combination with this electrosurgical unit. For further details, contact Olympus.

WARNING

If combinations of equipment other than those shown below are used, the full responsibility is assumed by the medical treatment facility.

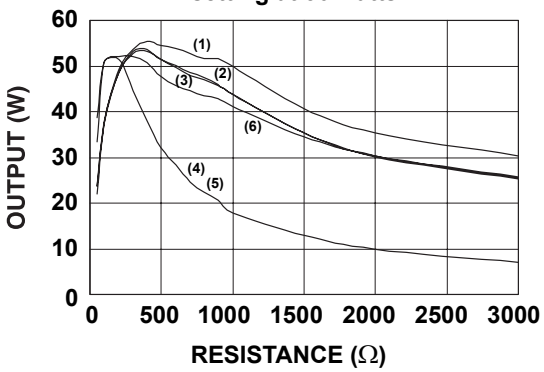
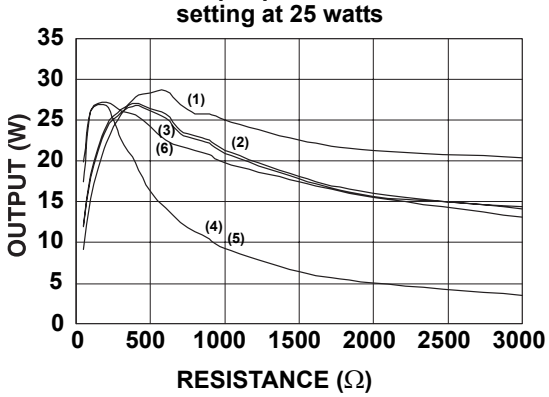
Endoscopic treatment with PSD-30 system chart

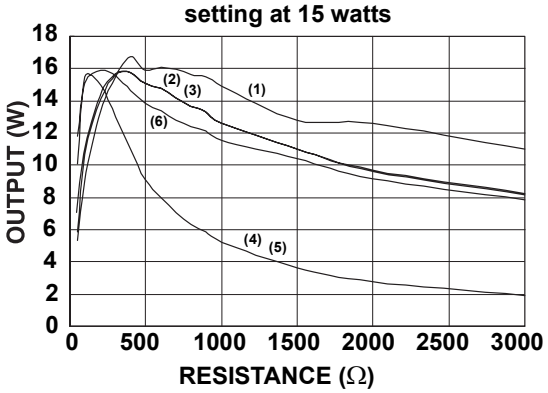


Operating environment

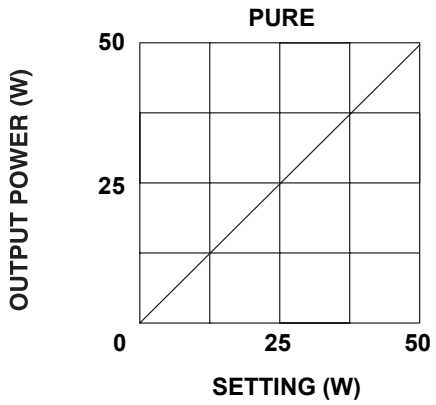
Operating environment	**Ambient temperature**	10 – 40°C (50 – 104°F)
	Relative humidity	30 – 85%
	Air pressure	700 – 1060 hPa (0.7 – 1.1 kgf/cm^2) (10.2 – 15.4 psia)
Storage environment	**Ambient temperature**	−25 – 70°C (−13 – 158°F)
	Relative humidity	10 – 90%

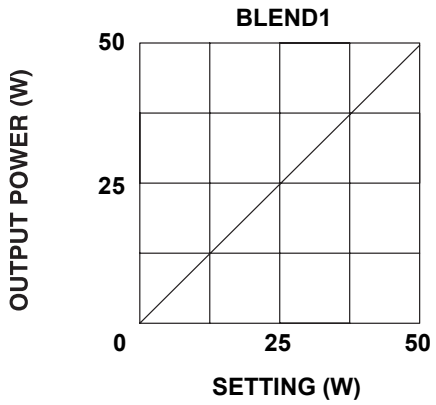
Specifications

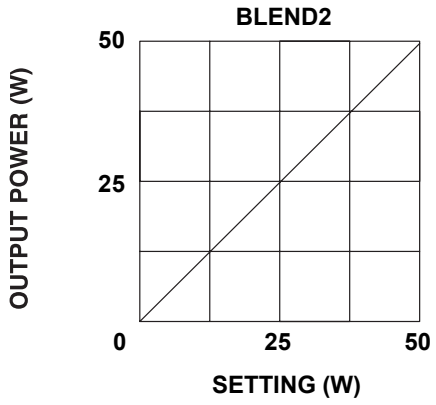
Item		Specification
Applicability	**Applicable field**	Endoscopic electrosurgery (restricted to endoscopes suitable for electrosurgery).
High frequency output	**Output method**	Monopolar modes
	Output types	Cut modes: 3 modes (PURE, BLEND1, BLEND2) Coagulation modes: 3 modes (SOFT, AUTO STOP, FORCED) The AUTO STOP output uses an identical waveform to SOFT and is provided with the auto stop function.
	Fundamental frequency	350 kHz
	Output characteristics	**Output power limitation setting at 50 watts**  **Output power limitation setting at 25 watts** 

Item		Specification
High frequency output	**Output characteristics**	**Output power limitation setting at 15 watts**  **(1) PURE** **(2) BLEND1** **(3) BLEND2** **(4) SOFT** **(5) AUTO STOP** **(6) FORCED**
	Maximum output	PURE: 50 W BLEND1: 50 W BLEND2: 50 W SOFT: 50 W AUTO STOP: 50 W FORCED: 50 W (Rated load resistance 300 Ω, SOFT, AUTO STOP: 100 Ω)
	Adjustment steps	5 W increments (below 5 W can be set on 2 W)

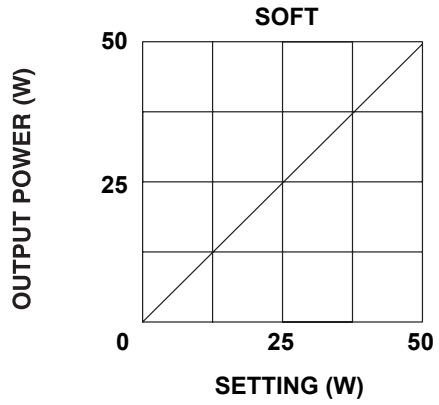
Item		Specification
High frequency output	**Output control**	Control by foot switch
	Output time	10 seconds ON and 30 seconds OFF output (to continue the output, keep the output time below 10 seconds)
	Output power vs setting	Rated load resistance 300 Ω

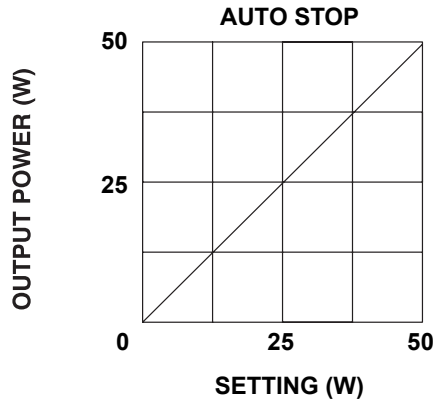


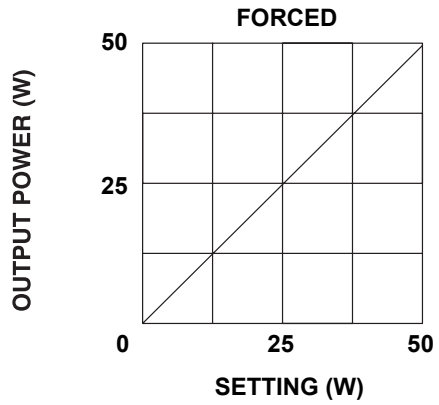




Item		Specification
High frequency output	**Output power vs setting**	Rated load resistance 300 Ω, (SOFT, AUTO STOP: 100 Ω)



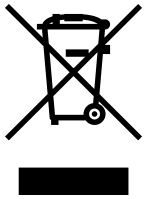




Item		Specification
Safety functions	**Patient/S-cord**	The function detects improper connections of cords and broken wires in the patient plate and S-cord. It activates the following functions if irregularities are detected: • Patient/S-cord warning indicator will light or flash. • If the above condition continues for a while, an alarm will sound and high frequency will stop. (When using an endoscope without S-cord, an alarm will sound and the high frequency output will stop immediately.)
	High frequency output monitor	The function detects whether the output level is in accordance with the output setting. It activates the following functions if irregularities are detected: • High frequency output warning indicator will light. • An alarm will sound. • Output will be prevented.
	Output time monitor	The function detects the high frequency output time. It activates the following functions if continuous output time exceeds the specified time: • Output time warning Indicator will flash after 15 seconds of continuous output. • If output continues for 15 more seconds (i.e. 30 seconds continuous output), the output time warning indicator will light constantly, the warning alarm will sound (in 5 second intervals), and output will be prevented.
	Foot switch monitor	The function detects short-circuit of the foot switch. It activates the following functions if a short-circuit is detected: • The alarm display on the output setting indicator will flash. • An alarm will sound. • Change of setting will be prevented. • Output will be prevented.
	CQM monitor	The function turns the CQM indicator on when a split-type patient plate is used and the connection between patient and patient plate is correct.

Item		Specification
Safety functions	**Self-check monitor**	The function detects whether the safety monitor functions mentioned above are working correctly or not. It activates the following functions if abnomalities are detected: • All indicators on the front panel will flash. • An alarm will sound. • Change of setting will be prevented. • Output will be prevented.
	Feedback ratio monitor	The irregularities are detected by calculating the ratio of delivered current (through either A-cord) to return current (through patient plate and S-cord). If the irregularities are detected, the following functions are triggered: • High frequency output warning indicator will light. • If the above condition continues for a while, an alarm will sound and high frequency output will be prevented. When using an endoscope without a S-cord, high frequency output warning indicator will light, an alarm will sound and high frequency output will be prevented.
Additional functions	**Stand-by mode**	When output is not performed for a long period and the stand-by mode is selected, the following operations are prevented: • High frequency output. • Change of setting classification (electromedical equipment)
	Adjusting the volume	• The output volume can be adjusted in the stand-by mode.
	PROGRAM mode	Call the setting and CUT/COAG. mode stored in the memory.

Item		Specification
Classification (electromedical equipment)	**Type of protection against electric shock**	Class I (3 pin power cord)
	Degree of protection against electric shock	TYPE CF (the patient leakage current below 10 μA) Note: Direct application to the heart should not be attempted as spark discharge during electrosurgery may affect the cardiac function of the patient (refer to dangers, warnings and cautions and EN standard (EN60601-1)).
	Degree of protection against explosion	Never use the electrosurgical unit where there is a risk of flammable gases.
	Additional	Defibrillation-protected equipment.
	Output circuit	Neutral electrode isolated from earth at high frequency.
Power supply	**Voltage**	220, 230, 240 V
	Frequency	50/60 Hz
	Input current	2 A
	Voltage fluctuation	Within ±10%
	Fuse rating	3.15 A, 250 V
	Fuse size	5.0 × 20 mm
Size	**Dimensions**	295 mm (W) × 160 mm (H) × 420 mm (L)
	Weight	7.8 kg

Medical Device Directive	CE 0197	This device complies with the requirements of Directive 93/42/EEC concerning medical devices. Classification: Class II b This device complies with the EMC requirements of EN 60601-1-2: 2001 when used in combination with devices bearing CE marking either on the products or in its instructions for use. Emission: Class B of EN 55011
WEEE Directive		In accordance with European Directive 2002/96/EC on Waste Electrical and Electronic Equipment, this symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to your local Olympus distributor for return and/or collection systems available in your country.
EMC	**Applied standards;** **IEC 60601-1-2: 2001** **IEC 60601-2-2: 1998**	This instrument complies with the standards listed in the left column. CISPR 11 of emission: Group 1, Class B (standby mode) This instrument complies with the EMC standard for medical electrical equipment; edition 2 (IEC 60601-1-2: 2001). However, when connecting to an instrument that complies with the EMC standard for medical electrical equipment; edition 1 (IEC 60601-1-2: 1993), the whole system complies with edition 1.
Year of manufacture	**7112345**	The year of manufacture is given in the second digit of the serial number.

EMC information

This model is intended for use in the electromagnetic environments specified below. The user and the medical staff should ensure that it is used only in these environments.

❍ Magnetic emission compliance information and recommended electromagnetic environments

Emission standard	Compliance	Guidance
RF emissions CISPR 11	Group 1	This instrument uses RF (Radio Frequency) energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Radiated emissions CISPR 11	Class B	This instrument's RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Main terminal conducted emissions CISPR 11		
Harmonic emissions IEC 61000-3-2	Class A	This instrument's harmonic emissions are low and are not likely to cause any problem in the typical commercial power supply connected to this instrument.
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	This instrument stabilizes its own radio variability and has no affect such as flicker in lighting apparatus.

❍ Electromagnetic immunity compliance information and recommended electromagnetic environments

Immunity test	IEC 60601-1-2 test level	Compliance level	Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	Contact: ±2, ±4, ±6 kV Air: ±2, ±4, ±8 kV	Same as left	Floors should by be made of wood, concrete, or ceramic tile that hardly produces static. If floors are covered with synthetic material that tends to produce static, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	Same as left	Mains power quality should be that of a typical commercial (original condition feeding the facilities) or hospital environment.
Surge IEC 61000-4-5	Differential mode: ±0.5, ±1 kV Common mode: ±0.5, ±1, ±2 kV	Same as left	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (> 95% dip in U_T) for 0.5 cycle	Same as left	Mains power quality should be that of a typical commercial or hospital environment. If the user of this instrument requires continued operation during power mains interruptions, it is recommended that this instrument be powered from an uninterruptible power supply or a battery.
	40% U_T (60% dip in U_T) for 5 cycle		
	70% U_T (30% dip in U_T) for 25 cycle		
	< 5% U_T (> 95% dip in U_T) for 5 seconds		
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	Same as left	It is recommended to use this instrument by maintaining enough distance from any equipment that operates with high current.

NOTE

U_T is the AC mains power supply prior to application of the test level.

❍ Cautions and recommended electromagnetic environment regarding portable and mobile RF communications equipment such as cellular phones

Immunity test	IEC 60601-1-2 test level	Compliance level	Guidance
			Formula for recommended separation distance (V_1=E_1=3 according to the compliance level)
Conducted RF IEC 61000-4-6	3 Vrms (150 kHz – 80 MHz)	3 V (V_1)	$d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m (80 MHz – 2.5 GHz)	3 V/m (E_1)	$d = \left[\frac{3.5}{E_1}\right]\sqrt{P}$ 80 MHz – 800 MHz $d = \left[\frac{7}{E_1}\right]\sqrt{P}$ 800 MHz – 2.5 GHz

NOTE

- Where “P” is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and “d” is the recommended separation distance in meters (m).
- This instrument complies with the requirements of IEC 60601-1-2: 2001. However, under electromagnetic environment that exceeds its noise level, electromagnetic interference may occur on this instrument.
- Electromagnetic interference may occur on this instrument near a high-frequency electrosurgical equipment and/or other equipment marked with the following symbol:

❍ Recommended separation distance between portable and mobile RF communications equipment and this instrument

Rated maximum output power of transmitter P (W)	Separation distance according to frequency of transmitter (m) (calculated as V_1=3 and E_1=3)		
	150 kHz – 80 MHz	80 MHz – 800 MHz	800 MHz – 2.5 GHz
	$d = 1.2\sqrt{P}$	$d = 1.2\sqrt{P}$	$d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

NOTE

The guidance may not apply in some situations.
Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.
Portable and mobile RF communications equipment such as cellular phones should be used no closer to any part of this instrument, including cables than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

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